the OIL AND GAS JOURNAL

STOP CORROSION
PROLONG EQUIPMENT LIFE
LOWER MAINTENANCE COSTS
SIMPLIFY LEASE OPERATIONS

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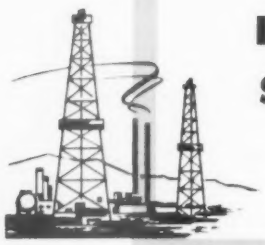

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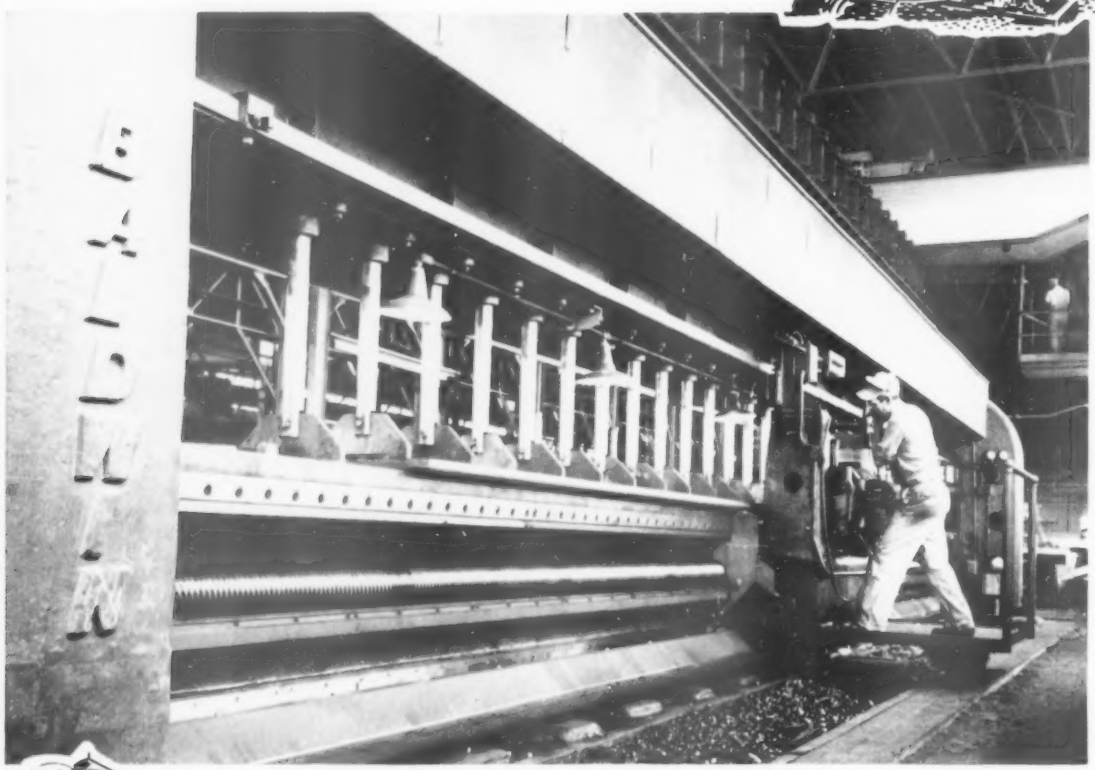

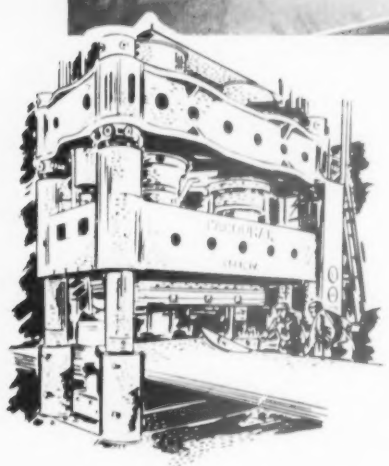

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DECEMBER 14, 1953 VOL. 52 NO. 32

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In Brief . . .

1. FASTER ESTIMATING . . . Charts are presented for rapid preliminary cost estimates with an accuracy of 20 per cent or better obtainable, where reasonable care and judgment are used. Often the accuracy is within 10 per cent. When a process flow sheet only is available, the engineer prices the process equipment from the charts and applies various percentages of these costs to calculate piping, insulation, instrumentation, indirect costs, and fees. If the proposed equipment is similar to existing equipment, its cost can be estimated by applying proper exponential factors to correct for size.

2. BETTER MAINTENANCE . . . Deterioration of refinery equipment is usually caused by corrosion. An idea of the corrosion rate can be determined from process study or from experience in operating similar plants. Also, some corrosion will be peculiar to that particular unit. Study of these factors will dictate frequency of the first few inspections of a new unit. After several inspections, a corrosion trend can be determined. Then some sections can be marked for detailed frequent inspections, and some can be left for routine inspections.

3. IMPROVED SELECTION . . . No single type of motor or control can be definitely designated as the one most suitable for pipeline use. The emphasis placed on low initial cost, low operating expense, safety, continuity of service, maintenance, appearance, remote operation, and various other properties will differ from station to station and will affect the selection of equipment for a given installation. These factors should all be given careful consideration, in the manner outlined by the author, for best selection of motors and controls.

4. FORECASTING SUCCESS . . . If a reservoir contains sufficient recoverable oil, that oil may be produced in a profitable manner by secondary-recovery means only if there is available enough injection fluid of a character that will displace the oil in a satisfactory way. Deciding whether recovery will be profitable can be done by comparison with other projects and by study of reservoir data.

5. SPOTLIGHTING COSTS . . . The drilling contractor can make his bid estimate on the basis of what his actual cost will be, if he makes use of the A.A.O.D.C. bid sheet. Costs are broken down into 16 categories into which will fall every item of expense directly or indirectly encountered in the drilling of a well.

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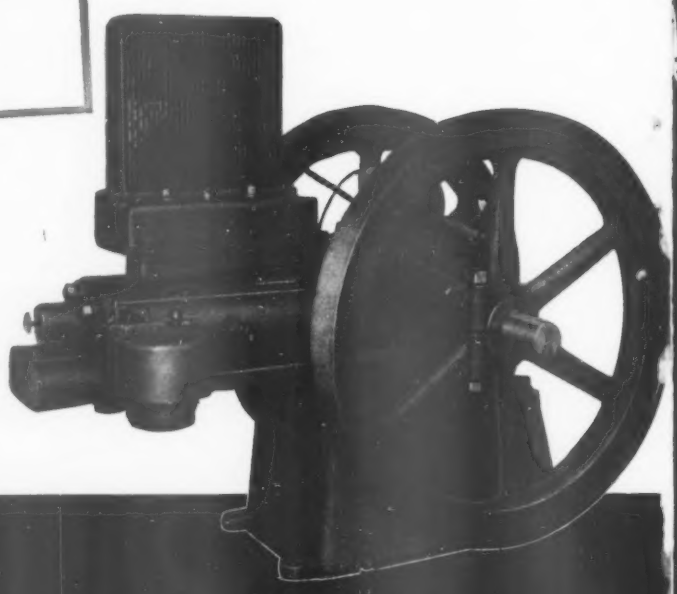

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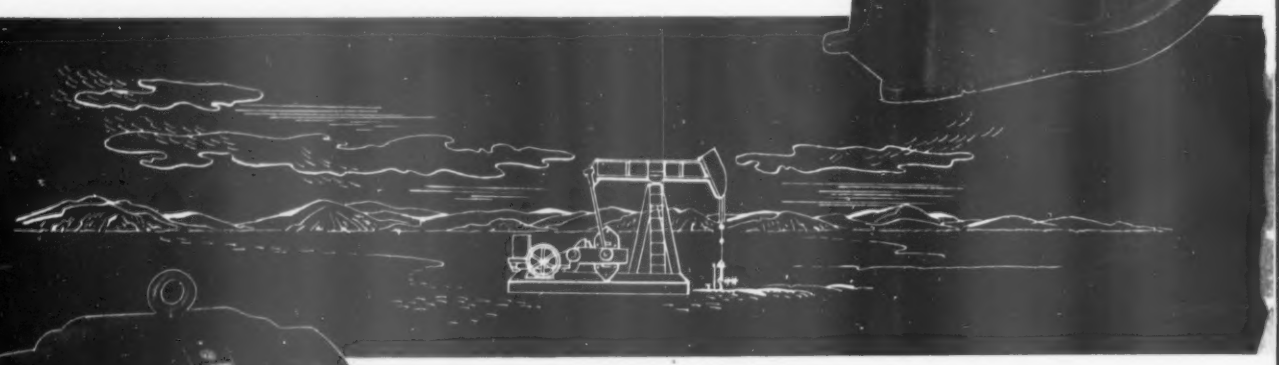

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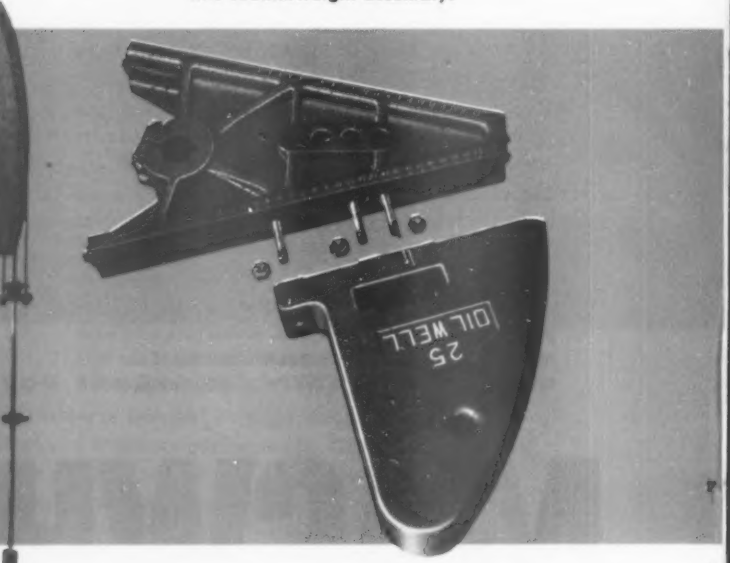
***Note*—how simplicity of design contributes to SAFETY in this counterweight assembly.**



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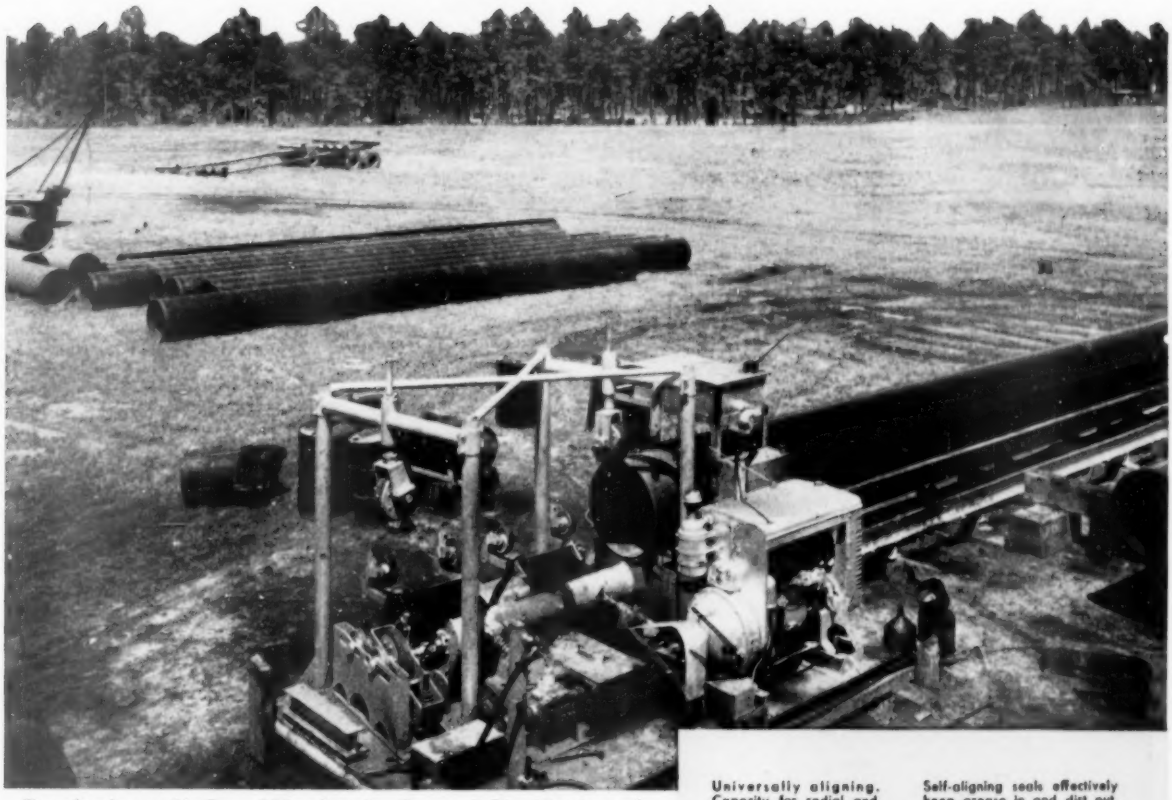

Every bearing on this General Manufacturing Company's Pipe Cleaning and Priming Machine is a Link-Belt ball bearing pillow block or flanged unit.

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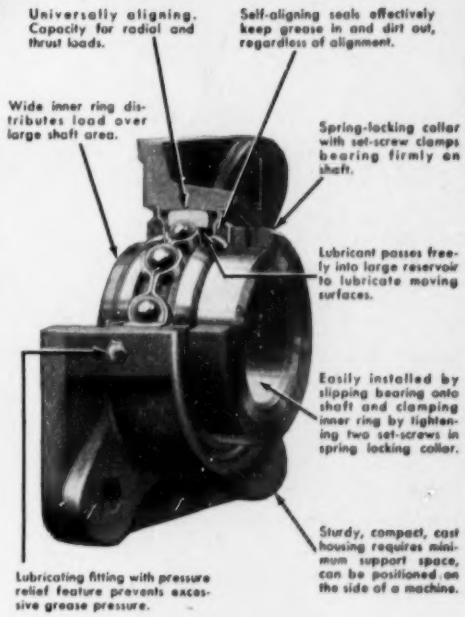
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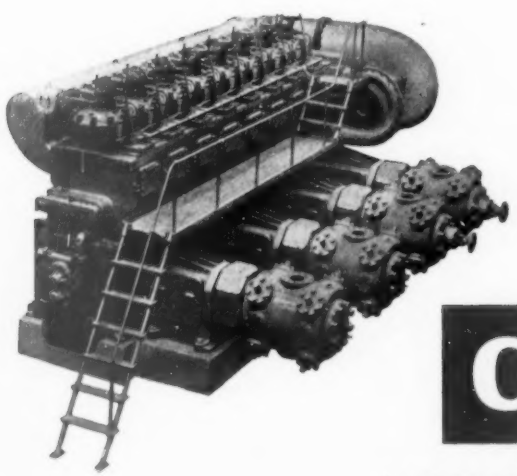

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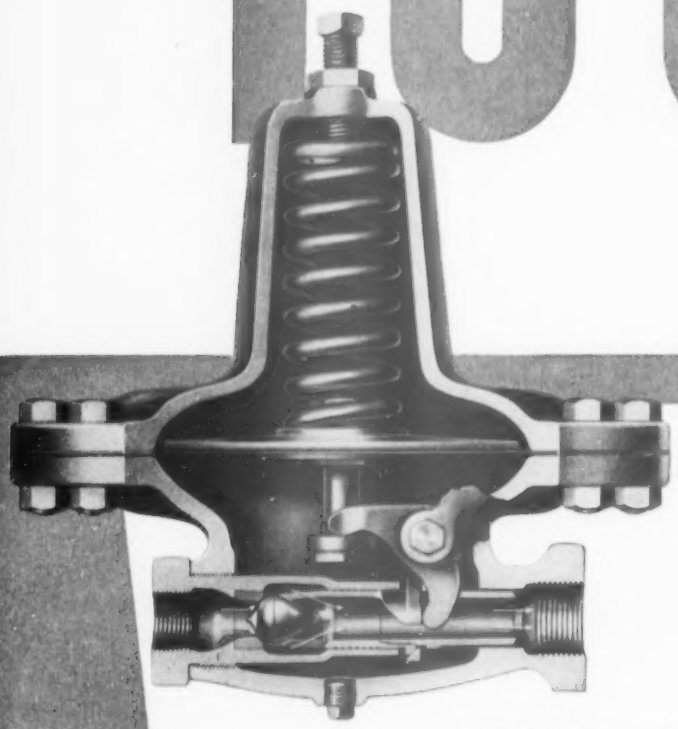

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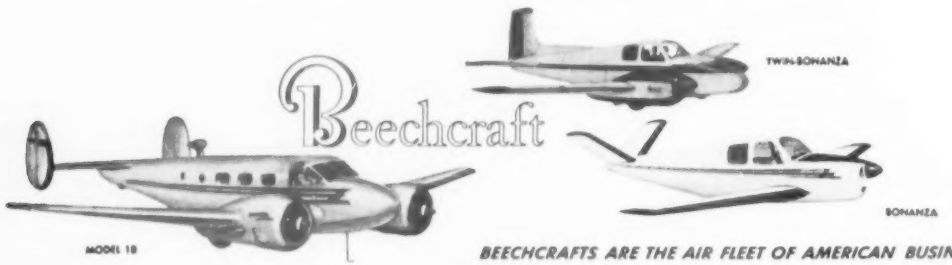

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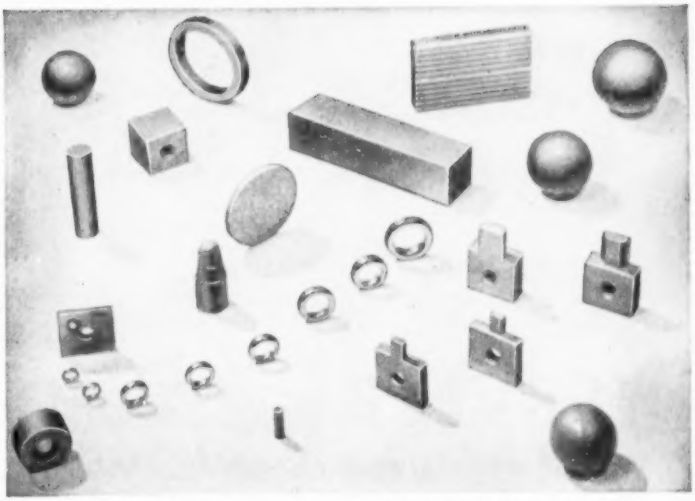

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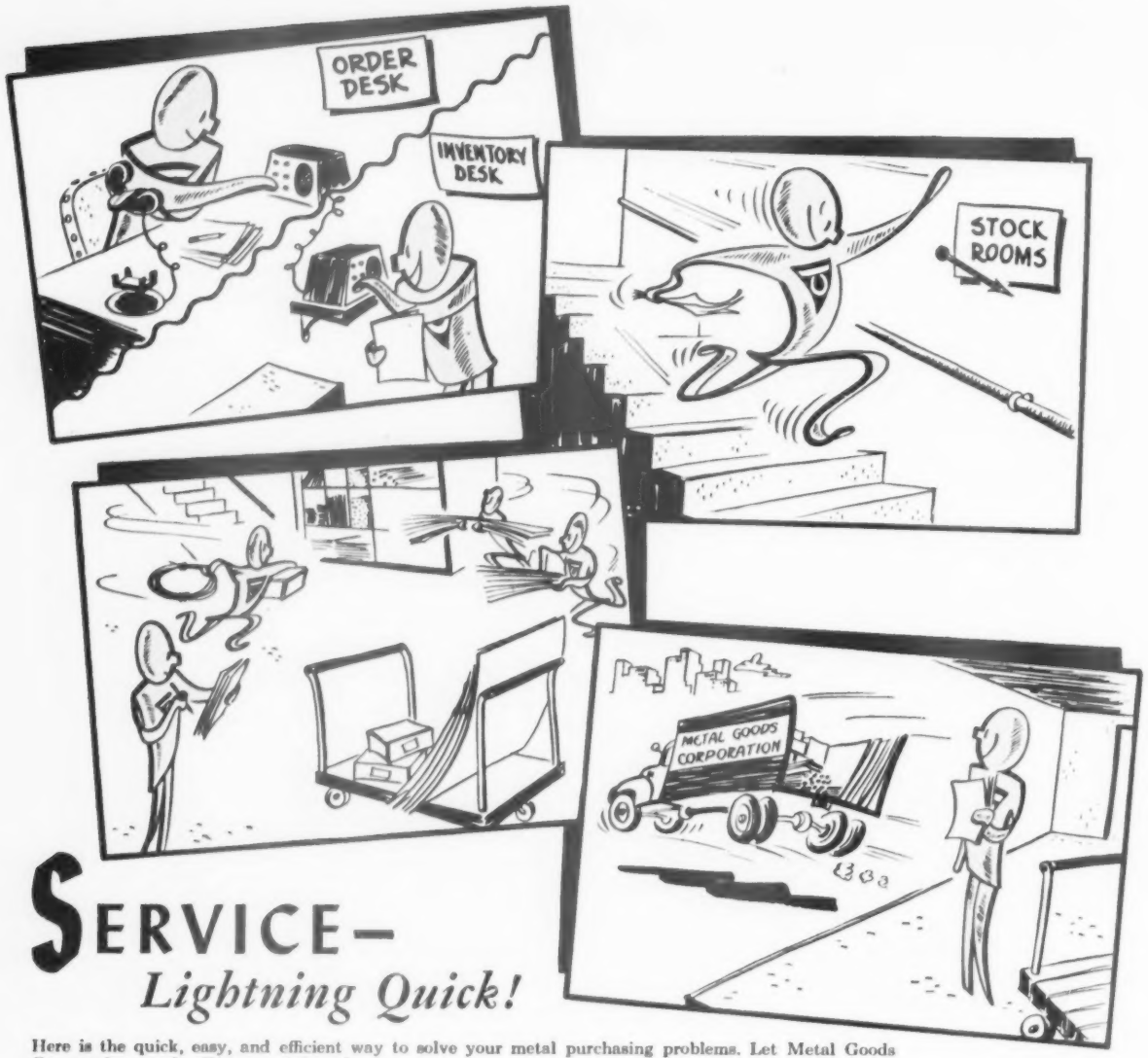

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Phone: 5-1232

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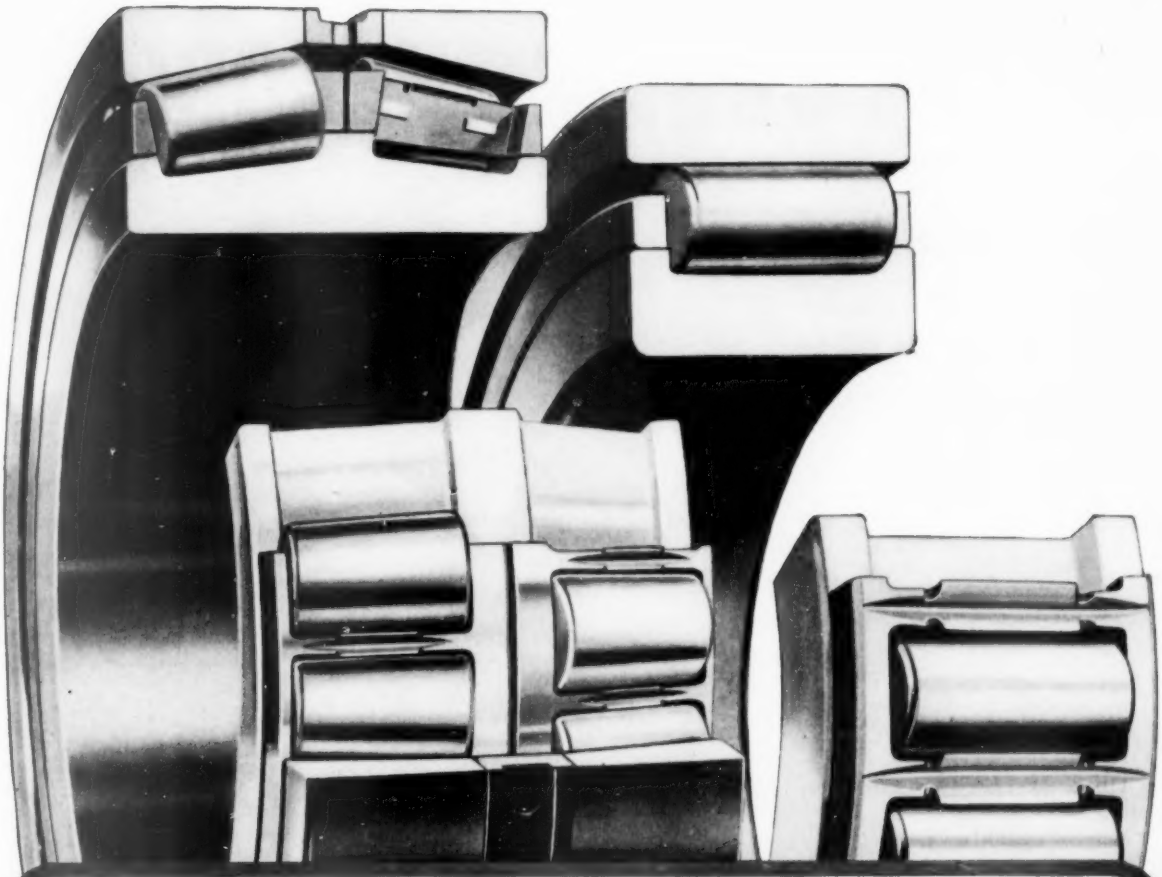
2600 Woodland
W. P. Crowley, Jr.
Phone: 4-9923

GENERAL OFFICES: ST. LOUIS 15, MISSOURI



TORRINGTON

TAPERED and CYLINDRICAL ROLLER BEARINGS

Give you these BIG ADVANTAGES

- **One-piece cast-bronze cages with machined pads in each roller pocket**—to assure accurate guiding of rollers.
- **Stabilized races**—to maintain accuracy of fit, improve bearing performance.
- **Individual roller retainment**—to assure adequate lubrication at roller, simplify inspection of race surfaces.
- **Precision tolerances and finishes on both rollers and races**—for minimum eccentricity and equal load distribution.
- **Controlled quality steels**—by use of electric furnace steels, through-hardening or case-hardening grades, and modern heat-treating methods—for increased bearing capacity and longer life.
- **Interchangeability**—in all types and sizes.

Backed by custom engineering to meet your load and speed requirements, these advantages add up to maximum performance for your bearing dollar. That's why it always pays to specify TORRINGTON!

THE TORRINGTON COMPANY

South Bend 21, Ind. • Torrington, Conn.

TORRINGTON BEARINGS

Spherical Roller • Tapered Roller • Cylindrical Roller • Needle • Ball • Needle Rollers

Before you buy:

CHECK SERVICE RECORDS!

Two rugged LS-85's, delivering 92 net hp each, speed a pipelining job by cleaning out a caved ditch near Many, La.

Quality construction slashes maintenance costs . . . matchless service minimizes downtime

WHAT OWNERS AND OPERATORS SAY ABOUT LINK-BELT SPEEDERS . . .

OWNER—"Only service in 18 months was two sets of cable, minor dipper repairs."
OWNER—". . . really fine distributor service."
OWNER—"My Link-Belt Speeder not only replaced two smaller rigs, but cost only $115 for service in five seasons!"
OPERATOR—"Running it over two years with no downtime."
OWNER—"Best dollars I ever spent . . ."
OPERATOR—". . . easy access for service. Self-cleaning crawler treads are really good!"
OPERATOR—"Only one clutch adjustment in eight months!"

WITH a Link-Belt Speeder, you're sure to get maximum production at minimum cost—not only for this season . . . *but for many seasons to come!* Also, with Link-Belt Speeder's world-wide factory-trained distributor service, you can be sure of prompt, expert service or parts replacement when you need them.

What's more, in every area there is a Link-Belt Speeder resident service engineer. It's his job to be acquainted with you and your particular problems.

If you'd like more information about the most complete line of crawler, wheel or truck-mounted shovel-cranes write for Catalog 2373.

LINK-BELT SPEEDER CORPORATION
Cedar Rapids, Iowa

13,052

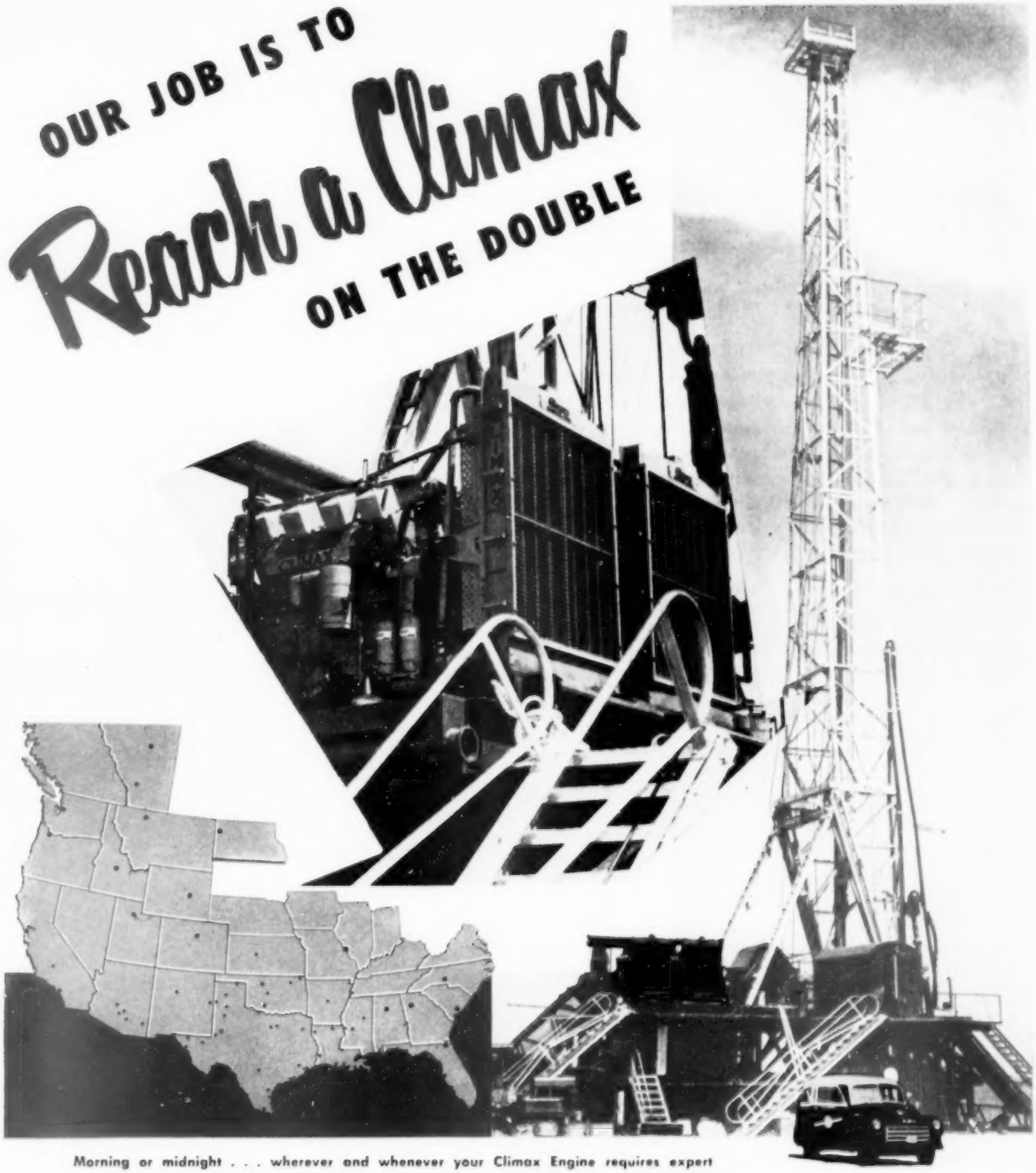
LINK-BELT SPEEDER
CORPORATION
BUILDERS OF A COMPLETE LINE OF CRAWLER, TRUCK AND WHEEL-MOUNTED SHOVEL-CRANES

FACTORY-TRAINED DISTRIBUTOR SALES AND SERVICE SPECIALISTS ...EVERYWHERE

OUR JOB IS TO

Reach a Climax

ON THE DOUBLE



Morning or midnight . . . wherever and whenever your Climax Engine requires expert attention . . . your nearby Climax Distributor loses no time in reaching you with famous Blue Streak Service. His detailed knowledge of power-packed Climax Engines enables him to provide fast, economical service . . . the kind of service that assures you of the smooth, dependable power that has made Climax the number one name in engines. So the next time your engines need service, call your Climax Distributor. You will find him thoroughly equipped with a complete stock of parts as well as the most modern repair facilities in the engine field. And remember . . . wherever you operate there is a Climax Distributor within two hours of your location.

climax BLUE STREAK ENGINES

Made by CLIMAX ENGINE AND PUMP MFG. CO. Factory and General Offices: Clinton, Iowa. Oil Field Sales Office: 155 Continental Ave., Dallas, Texas.

ALL FORGED STEEL

Edward

STOP AND CHECK VALVES

For Pressures Up To 7500 lbs.

Rated for 7500 lbs. at 125F in 2 in. sizes, and for 6000 lbs. at 125F in the ½ to 1½ in. sizes, Edward's complete line of all forged steel high pressure valves are used in thousands of applications involving excessive pressures and temperatures under 300F. Fig. 158 stop valves, in either globe or angle styles, provide fast, certain shut-off or accurate pressure control. Fig. 160 check valves protect costly equipment, eliminate danger by preventing sudden reversal of flow.

FIG. 158

Construction Features Like These Give Longer Life, Reduce Replacement Costs And Lower Maintenance Time:

FIG. 158 STOP VALVES

- Drop forged steel bodies specially heat treated.
- Stem at 60 degree angle to reduce wear producing turbulence, lower pressure drop.
- Seat, disk, and stem of EValloy 13% chromium stainless steel.
- Renewable screwed in seat with long threads below pressure joint for leak proof seating
- Inside screw construction, deep stuffing box and special gland and packing nut design to lengthen packing life.
- Bonnets EValized by exclusive plating process for maximum corrosion and abrasion resistance.
- Body contours streamlined for free flow with low pressure drop.
- Stem of EValloy stainless steel, centerless ground to fine finish, long wearing Acme form threads, backseating shoulder.

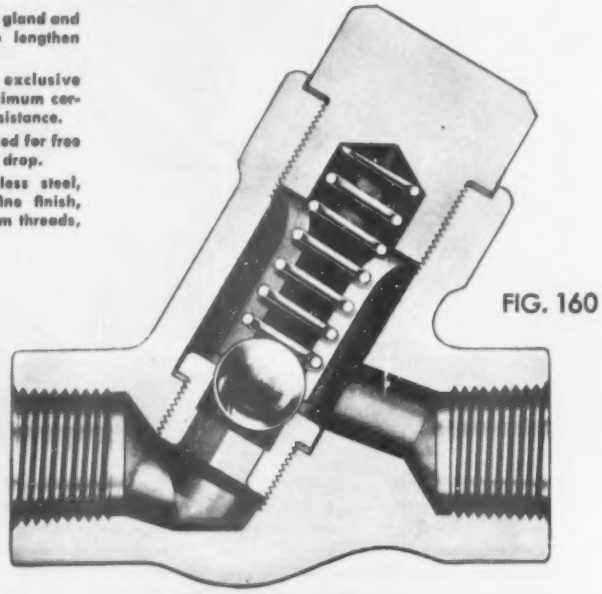


FIG. 160

FIG. 160 CHECK VALVES

- Body and seats identical with globe or angle valves above.
- Rolled steel bonnet with two ribs for guiding ball to accurate seating.
- Balls of corrosion resistant, high carbon stainless steel accurately ground for tight seating.
- High Carbon stainless steel springs, sufficiently long to provide positive aid in seating ball in services involving heavy viscous fluids.

Available In Wide Range of Sizes and Styles

- Stop valves furnished in globe or angle styles.
- Check valves furnished in horizontal or vertical styles.
- All valve styles furnished in sizes ¼", ⅜", ½", ¾", 1", 1¼", 1½", 2".
- All valve styles furnished with either screwed or socket welding ends.

Edward builds a complete line of cast and forged steel valves for pressures from 150 lbs. to 7500 lbs., including globe and angle stop valves, gate valves, non-return valves, blow-off valves, feedline stop-check valves, integral bonnet Univalves, relief valves, hydraulic valves, instrument valves, gage valves and strainers. Write for Catalog 104.

Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY

1492 West 145th Street, EAST CHICAGO, INDIANA

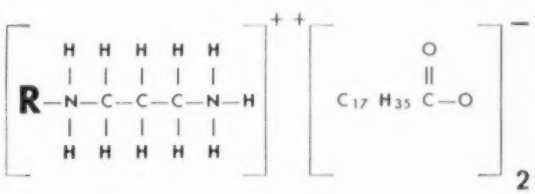
Another Product

New Armour chemical cuts corrosion costs of primary wells

Major petroleum companies find Duomeen® T Dioleate more effective than dilute inhibitors — and lower in cost!

The latest development of the Armour Chemical Division's petroleum chemists is Duomeen T Dioleate—a potent corrosion inhibitor for "Down the Hole" treatment of primary producing wells. The ability of this new cationic surface active agent to convert steel surfaces from water-wettable to oil-wettable, thus forming a protective film, is the reason for the excellent protection provided by Duomeen T Dioleate.

Manufactured under exacting laboratory specifications, Duomeen T Dioleate is supplied *100% active*—water insoluble but readily soluble in common solvents. Particularly outstanding results have been obtained in controlling acid conditions in sour wells. Laboratory and field tests report 20 ppm of this chemical sufficient to gain maximum effectiveness. While this amount is reported as being successful, it is realized that specific locations and conditions may exist where greater concentrations are necessary. However, since Duomeen T Dioleate is supplied 100% active, it provides great flexibility by permitting the user to meet such conditions by making up any desired solution at the site. Duomeen T Dioleate also has application in other hydrocarbon systems and product lines. For the benefit of engineers who wish to know the chemical structure of this new and unique product, the structural formula for Duomeen T Dioleate is as follows:



Samples and complete data are readily available. Simply fill in and mail the coupon with your letterhead for free samples and a copy of our "Combat Corrosion" bulletin and Technical Bulletin E-6, "Chemical Treatment in Oil Wells."

Mail This Coupon With Your Letterhead

Armour Chemical Division
1355 W. 31st Street, Chicago 9, Ill.

Please send me:

- ☐ Samples of Duomeen T Dioleate
- ☐ "Combat Corrosion"
- ☐ Tech. Bull. E-6, "Chemical Treatment in Oil Wells"

Name .....

Title .....

Firm .....

Address .....

City ..... *Zone* ... *State* .....

ARMOUR CHEMICAL DIVISION

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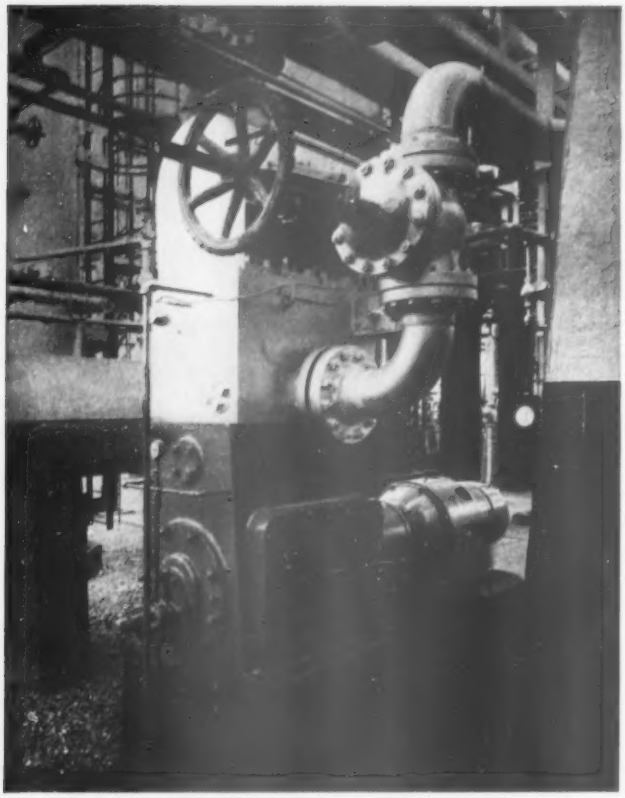


WORTHINGTON POWER PUMP handles light hydrocarbons at Indiana refinery. Close-clearance liquid end makes this pump a natural for handling propane, butane, and other volatile fluids

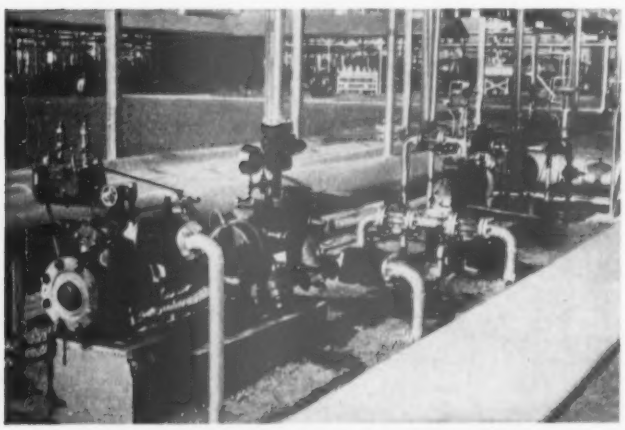
Power pump?
Steam pump?
Rotary pump?

You name it... we make it!

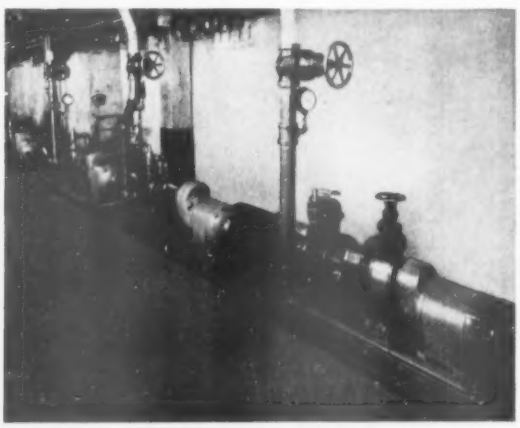
• When you're in the market for a pump, it stands to reason that you'll do better by going to a pump specialist. And that's exactly what Worthington has been since 1840.

Because we make all types of pumps—in thousands of different sizes—we're able to give an unbiased, objective opinion about any and all of your pump needs. No matter what your pressure requirements or type of power available, there's a Worthington pump that will suit your application exactly.

Write and tell us about your pumping problems. Be sure to give all pertinent details. Drop a line to your nearest Worthington district office or write directly to Worthington Corporation, Reciprocating Pump Division, Section P.3.2, Harrison, New Jersey. P.3.2



WORTHINGTON STEAM PUMPS pick up condensate from scrubbers for this petroleum company in Oklahoma. These units are part of Worthington's HiVol line—pumps specially designed to handle highly volatile liquids with high volumetric efficiency



WORTHINGTON ROTARY PUMPS at this oil company plant in Pennsylvania are used for filling cans with motor oil of various viscosities. Every Worthington rotary pump is completely tested on oil before being put in stock.

MEMBER

WORTHINGTON

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

Centrifugal • Rotary • Steam • Power • Vertical Turbine

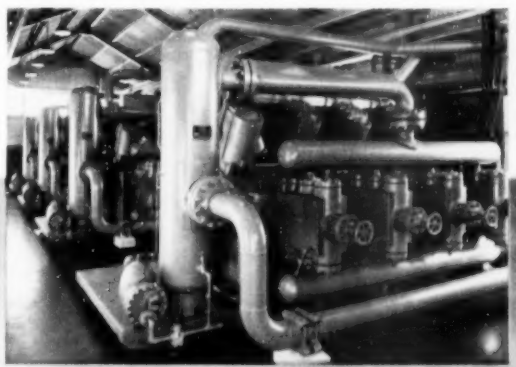
BEAIRD-INGERSOLL-RAND
Packaged Compressor Plant

Lowest Cost Per Horsepower Installed

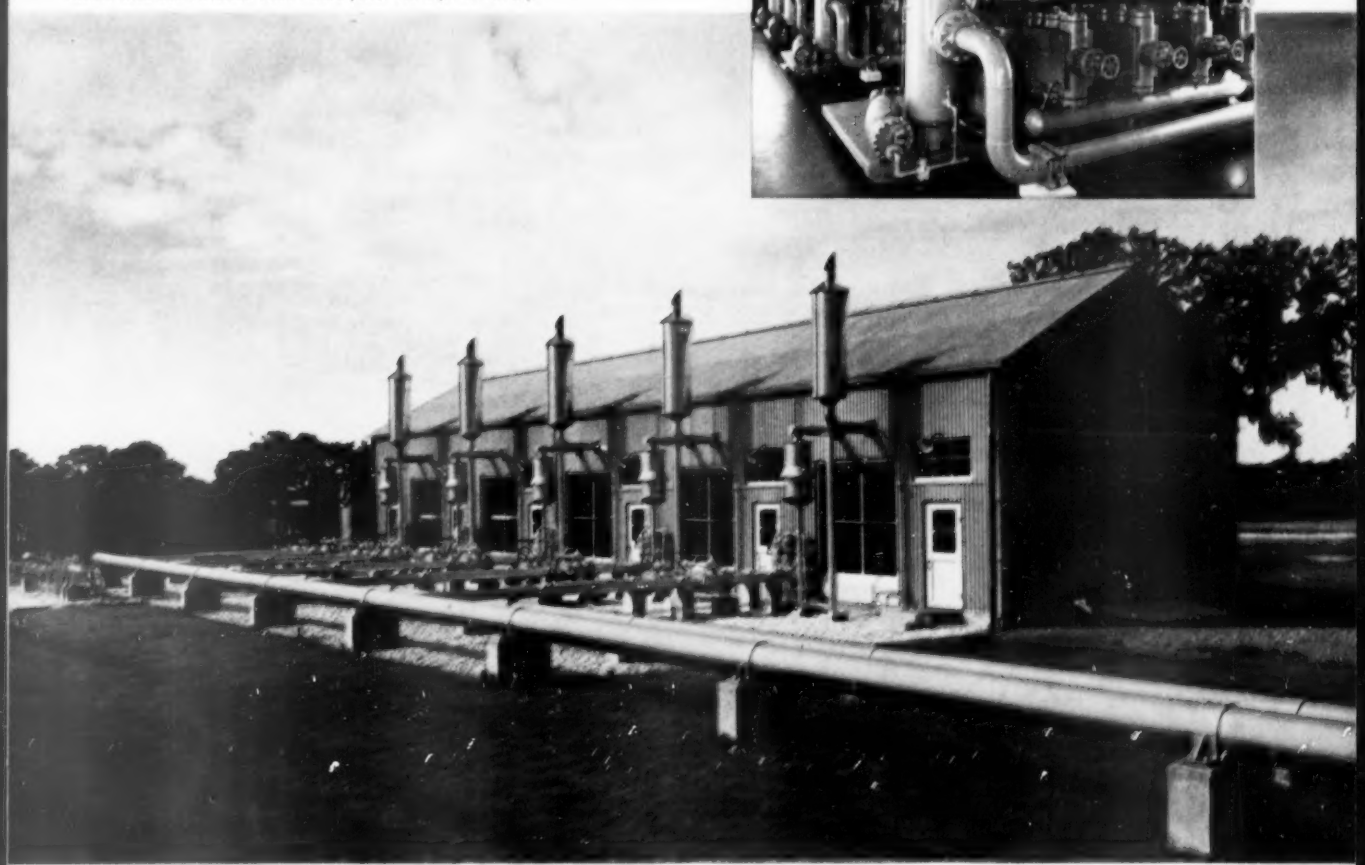
WILCOX TREND GATHERING SYSTEM, INC., picks up natural gas from fields along a 150 mile line and delivers it to the twenty-four inch main transmission line of Texas Eastern Transmission Corporation at that company's Provident City, Texas terminus. To maintain pressures required to move the gas into Texas Eastern's line, Wilcox installed a bank of five Beaird-Ingersoll-Rand packaged compressor plants. These plants, located near Thomaston, Texas were equipped with regulators which vary the speed of their 4-cycle engines from as low as 50 per cent to 100 per cent. The regulators automatically slow down the engines or speed them up to maintain the required discharge pressure at the compressors in spite of fluctuating volumes and suction pressures from the fields. The packaged plants were engineered, built and assembled in the Beaird factory and shipped to location as complete, self contained plants. *Let us give you all the facts about Beaird-Ingersoll-Rand packaged compressor plants.*

5 Packaged Compressors —

AUTOMATIC CONTROLS MAINTAIN STEADY DISCHARGE PRESSURES



Each of these five Beaird-Ingersoll-Rand packaged compressor plants includes Ingersoll-Rand gas engine driven compressor, Young radiator and all necessary components, connections and controls. Other sizes from 110 h.p. to 550 h.p.

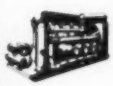


THE J. B. BEAIRD COMPANY, INC.

SHREVEPORT, LOUISIANA

BEAIRD

MACHINING MANUFACTURING STEEL WAREHOUSE



PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP GAS SYSTEMS

BEAIRD *Cast Steel Fittings*

FITTINGS *IN A HURRY*

Need fittings in a hurry? Want to be sure of meeting your deadlines? Have to meet an emergency with minimum down time? Then ask your supply house ... or call us direct ... for immediate shipment of Beaird fittings from our large stock of standard sizes. Save time in ordering by using the convenient selection charts and figure numbers in our new catalog No. 153. We can also give you prompt delivery on special fittings from our wide assortment of patterns.

Write for Catalog 153 and let us put your name on our mailing list for current stock lists.

THE J. B. BEAIRD COMPANY, INC. *SHREVEPORT, LOUISIANA*

BEAIRD

MACHINING MANUFACTURING STEEL WAREHOUSE

PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

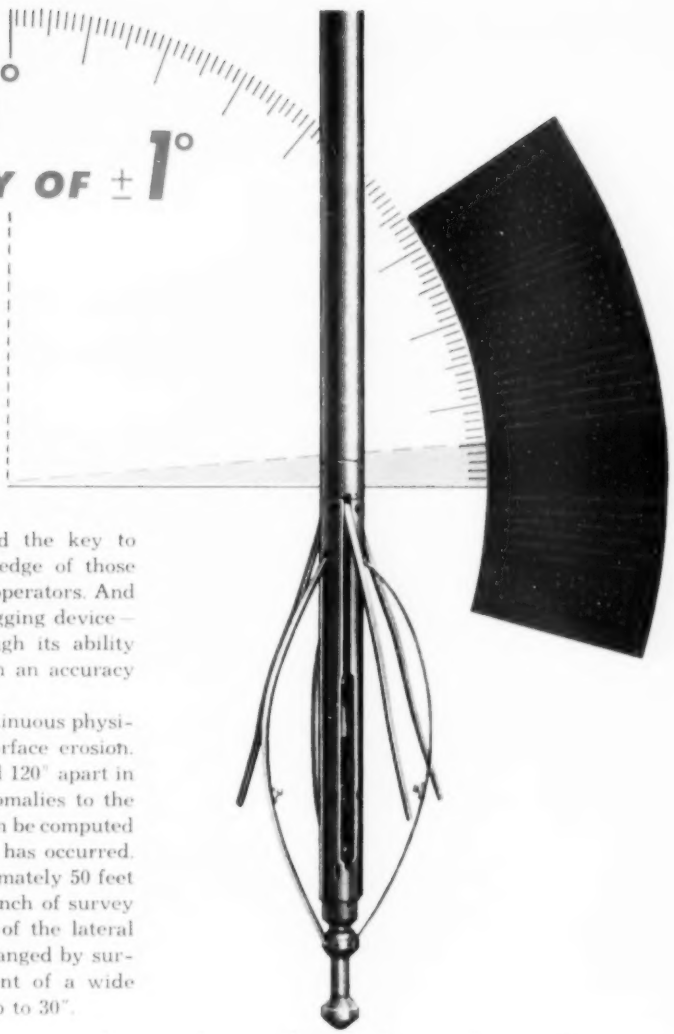
PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP GAS SYSTEMS

MEASURES DIP OF 5° WITH ACCURACY OF ±1°

HALLIBURTON'S *new* DIP LOG



Because subsurface formations hold the key to profitable pay zones, precise knowledge of those formations is of vital importance to operators. And Halliburton's new electronic well logging device—the Dip Log—gains in value through its ability to measure even low angle dip with an accuracy of ±1°.

Halliburton's Dip Log traces a continuous physical profile of the dip angle of subsurface erosion. Three sensitive profiling arms spaced 120° apart in azimuth transmit the location of anomalies to the surface. Dip angle and its direction can be computed at any level where sufficient erosion has occurred.

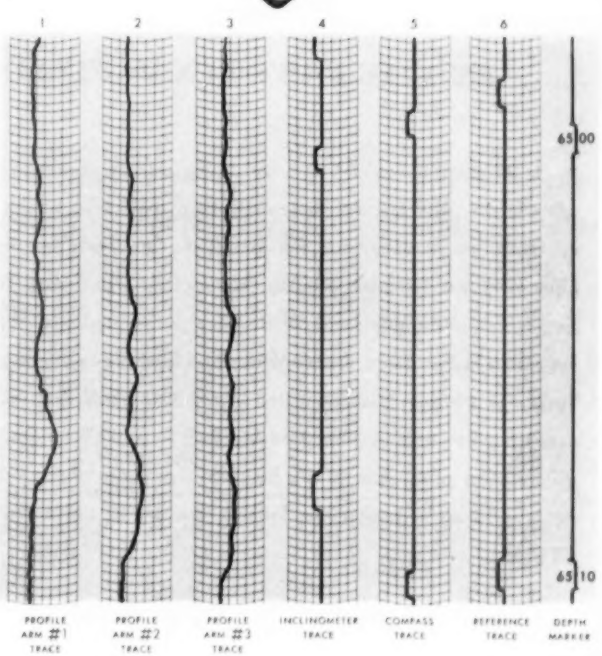
These Dip Logs are run at approximately 50 feet per minute on a depth scale of one inch of survey to one foot of hole. The sensitivity of the lateral scale of the profiling arms can be changed by surface control—allowing measurement of a wide range of hole diameter, from 6¾" up to 30".

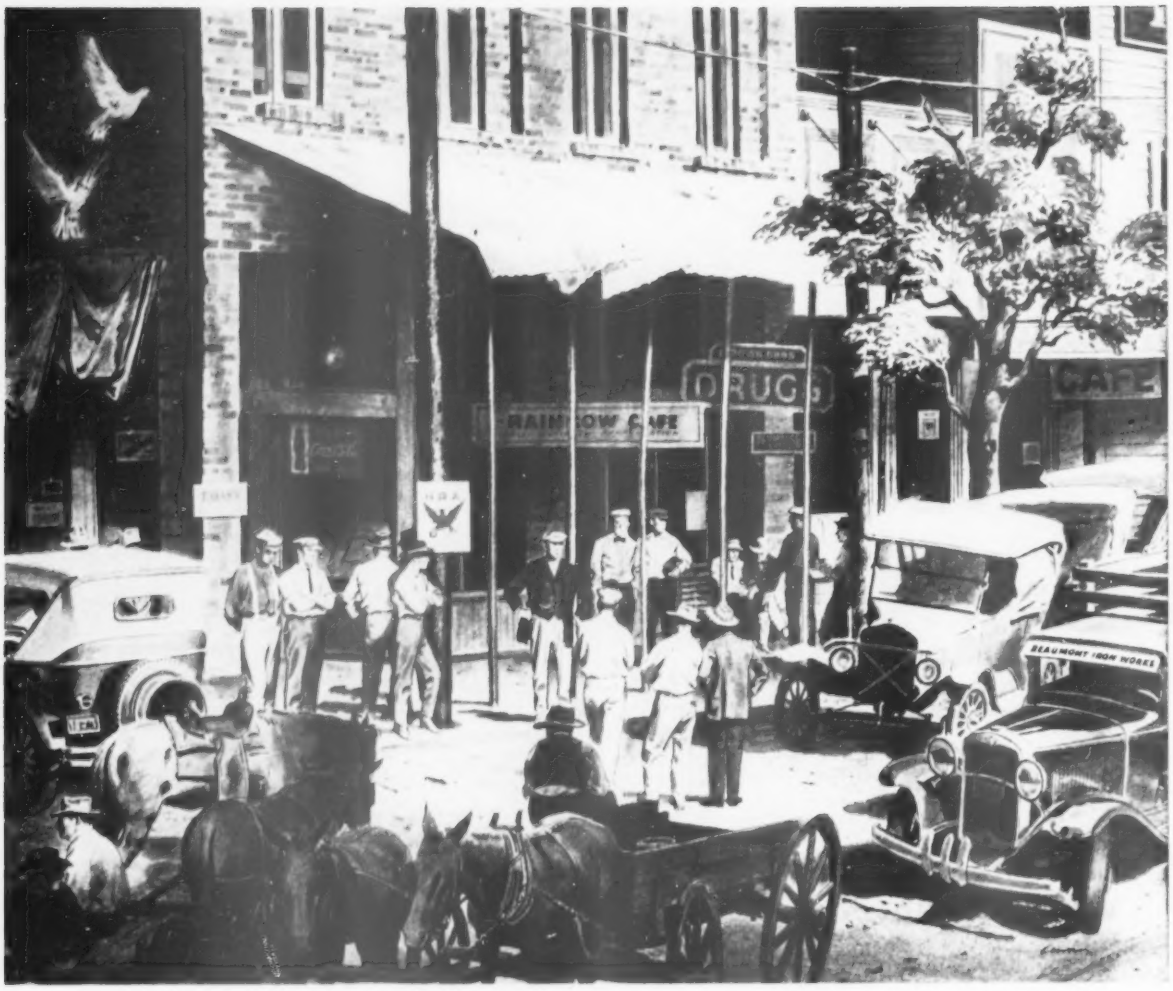
The accuracy of determining downhole dips depends also on proper interpretation of results. Halliburton specialists know their Dip Logging instruments, and their considered correlation of all available information is one more reason why you get accurate profile of subsurface formations, even in the case of extreme low angle dips.

Your nearby Halliburton representative will gladly give you the facts on how Dip Logging can serve you. A laboratory bulletin regarding the service is available on request. Contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

YEARS AHEAD IN ELECTRONIC LOGGING!





IN THE EAST TEXAS FIELD-WE DID OUR PART TOO

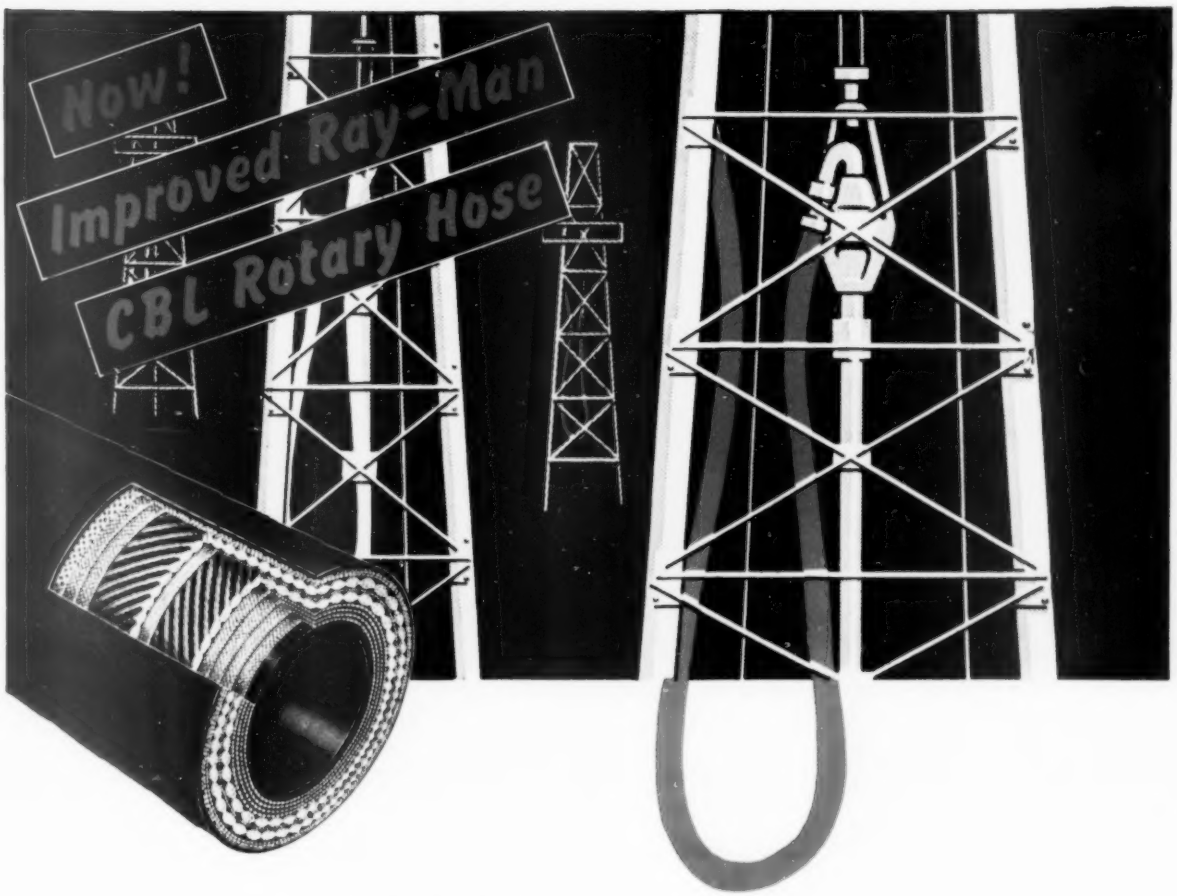
In the oil boom towns of East Texas in the Thirties, men made deals, scrambled after leases, and the storekeepers put up their Blue Eagles. And in the new oil fields, we at Beaumont Iron Works did our part, too. For BIW well head equipment was the overwhelming choice of oil men in East Texas.

Engineered and designed to do the job right and to do it for the years, you can see today in East Texas the toughness and long life built into all BIW equipment. Today, at the ***new*** Beaumont Iron Works Co., you'll find that the same toughness is engineered into BIW products. Built to do its job right, BIW equipment in drilling and production is still built for the years ahead—built to do its job right and built to justify your faith in this, one of the oldest companies in the oil fields.

BIW

BEAUMONT IRON WORKS
BEAUMONT, TEXAS
Subsidiary of American Locomotive Co.
General Sales Office: 1404 Dunlavy St.,
Houston 19, Texas
Warehouses in Beaumont and Odessa

ANOTHER LEADING OIL PRODUCING AREA WHICH HAS DEPENDED ON BIW EQUIPMENT.



FOR LOWER RIG COSTS . . . Special cable wire reinforcement is one of the important improvements in Ray-Man CBL Rotary Hose that makes it still *more* flexible—with a higher factor of safety. The Ray-Man method of winding high tensile steel cable strength members under precisioned tension permits rotary hose flexibility never before equaled. The new Ray-Man resists kinking and, if accidentally crushed, will come back to full roundness under pressure. It is strong and blow-out proof. Built-in coupling features the "Lip-Lok" seal that tightens under high pressure. Ray-Man is easier than ever to make up in the rig and field tests prove it will give you MORE USE PER DOLLAR.

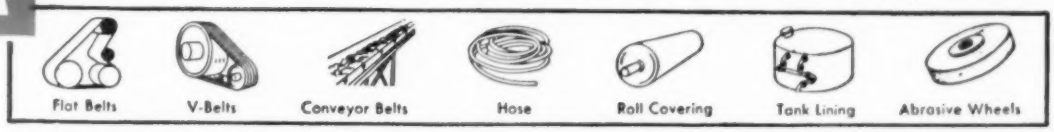
DISTRIBUTED BY NATIONAL SUPPLY COMPANY IN ALL PRINCIPAL OIL FIELDS

Write for Catalog 6903, describing Raybestos-Manhattan's full line for the oil industry; hose, V-belts, transmission belts, brake lining and packing.

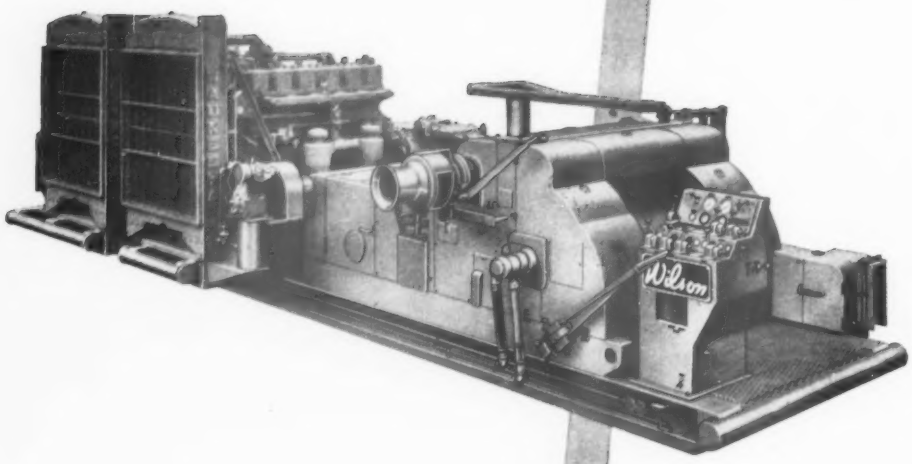
R/M

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Teflon Products • Packings • Sintered Metal Parts • Bowling Balls



WILSON'S "Giant" power rig designed by practical men

Newest in the famous line of Wilson Manufacturing Company's drilling rig is the "Giant" model—built for drilling 8,000 feet using 4½" drill pipe and 9,500 feet with 3½" drill pipe.

The Wilson "Giant" Rig incorporates all the latest and most improved features to be found in any drilling rig, and many features exclusive to Wilson.

Among the important features of the "Giant" is one on which Wilson places special emphasis – the extensive use of SKF ball and roller bearings. They are an important factor in helping to make these new Wilson rigs the *World's finest!*

equipped with SKF bearings designed for practical application

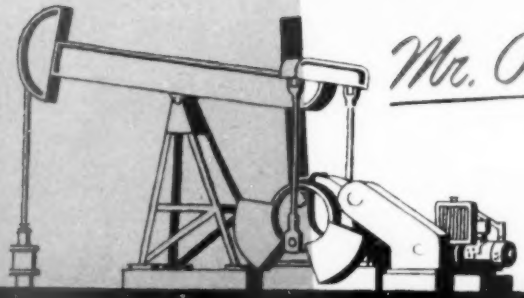
Here is still another manufacturer of oil field equipment who depends on SKF Bearings – in this case SKF Single Row Deep Groove Ball Bearings and Spherical Roller Bearings.

Wilson Manufacturing Company specifies SKF Single Row Deep Groove Ball Bearings because of their high radial as well as substantial thrust capacity at high speed; SKF Spherical Roller Bearings for their unexcelled capacity for heavy radial and thrust loads, and self-aligning features.

For hardworking oil field applications, you can rely upon the *performance* of SKF Bearings, the *service* of SKF Engineers, the *dependability* of SKF Distributors. 7429

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA., *manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.*

SKF
BALL AND ROLLER BEARINGS



Mr. Oil Producer:

For the lowest-cost pumping with complete dependability . . .

AJAX GAS AND OIL ENGINES

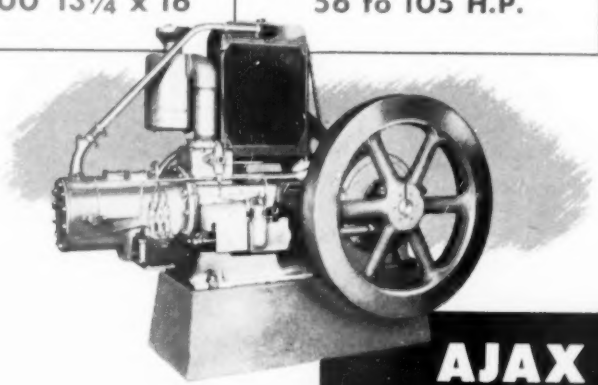
MODEL	A.P.I. HORSE POWER RATING
5 x 6½ WL	5 to 12½ H.P.
6½ x 8 CMA	12 to 19 H.P.
7¼ x 8 CMA	13½ to 22½ H.P.
7½ x 10 CMA	16 to 26 H.P.
8½ x 10 CMA	21½ to 36½ H.P.
DP-70 11 x 14	34 to 70½ H.P.
DP-100 13¼ x 16	56 to 105 H.P.

Pick the right horsepower and *Specify*

Ajax

The Complete line of

OILFIELD PUMPING ENGINES



AJAX makes it easy for you to pick the type and size of pumping engine best fitted to your needs—we build them in the entire range demanded by today's oil producers. And AJAX and your Supply Man make it easy for you to compare the facts—we have them all! *Let us serve you.*

AJAX

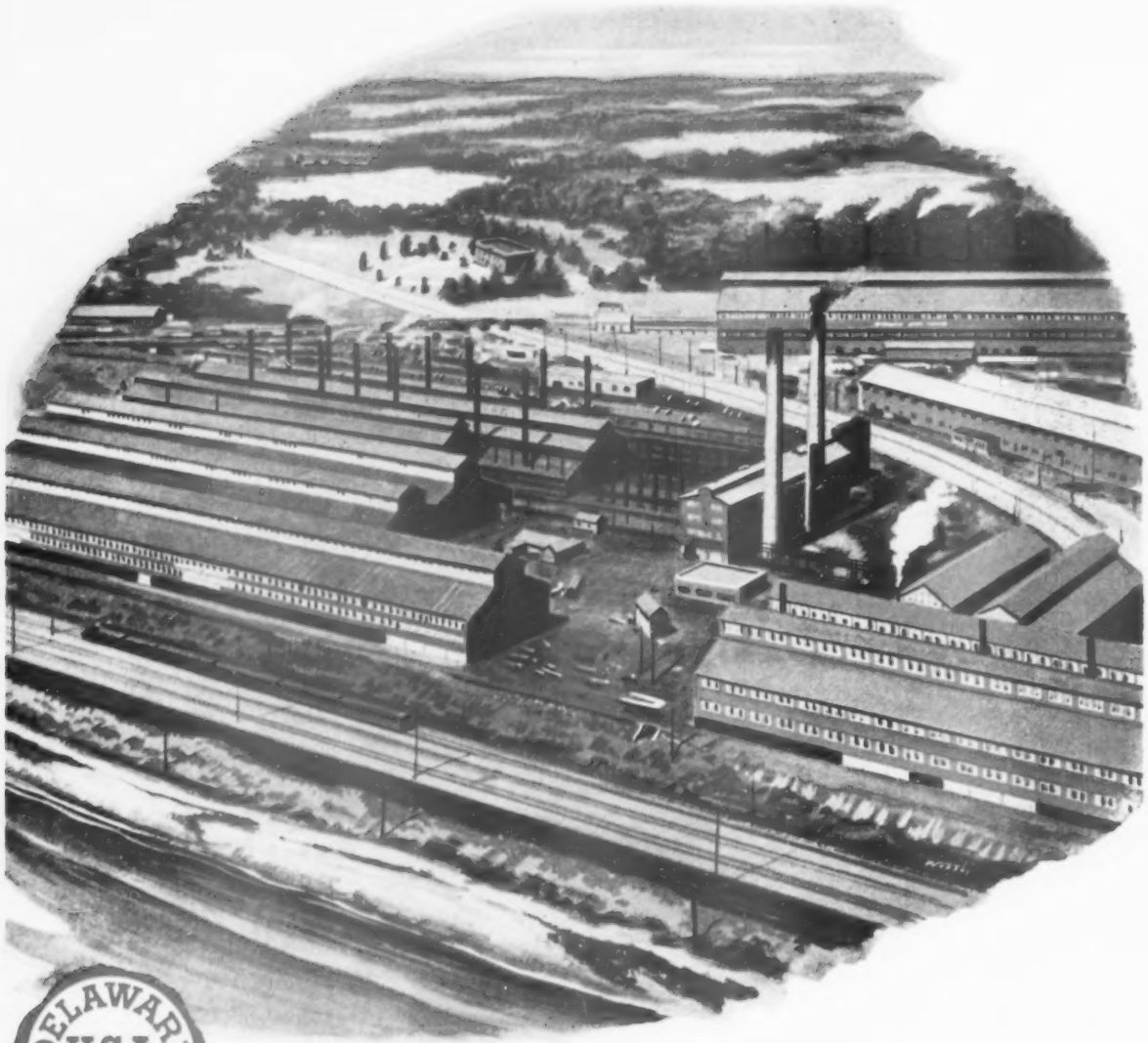
PESA

AJAX IRON WORKS

Builders of GAS AND OIL ENGINES, PRESSURE PUMPS, STEAM DRILLING ENGINES, INDUSTRIAL STEAM ENGINES

CORRY, PENNSYLVANIA

Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA.
R. B. MOORE SUPPLY CO., BOLIVAR, N.Y. • BETHLEHEM SUPPLY CO., TULSA, OKLAHOMA



DELAWARE U·S·A VALLEY

America's fastest growing industrial area

HOME OF CLAYMONT STEEL

Here at Claymont, in the fast-expanding industrial empire on the Delaware River, are the open hearths, rolling mills, flanging shops, and pipe mill that turn out a wide variety of Claymont Products.

These include Alloy and Carbon Steel Plates . . . Stainless-Clad Plates . . . Flanged and Dished Heads . . . Manhole Fittings and Covers . . . and Large Diameter Welded Steel Pipe for transmission of oil, gas or water.

In our Claymont plant all of these products are under complete quality control starting with the making of steel in our own open hearth furnaces and continuing through every step of manufacture.

1981

CLAYMONT STEEL

WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION
CLAYMONT, DELAWARE

CF&I

NOW . . . greater handling efficiency . . .
lower production costs . . .
WET SODA ASH STORAGE SYSTEMS
A number of manufacturers using soda ash in their operations are finding it profitable to store the material in solution or as a slurry. The wet systems provide greater ease of handling and substantial savings in installation and processing costs. In solution, a maximum of 3.3 pounds of soda ash per gallon of tank capacity may be stored; in slurry form, more than six pounds per gallon.
Mathieson, a major producer of top-quality soda ash for over 60 years, can offer you complete information and comprehensive technical service on soda ash handling and storage systems. Call your Mathieson representative or write today.
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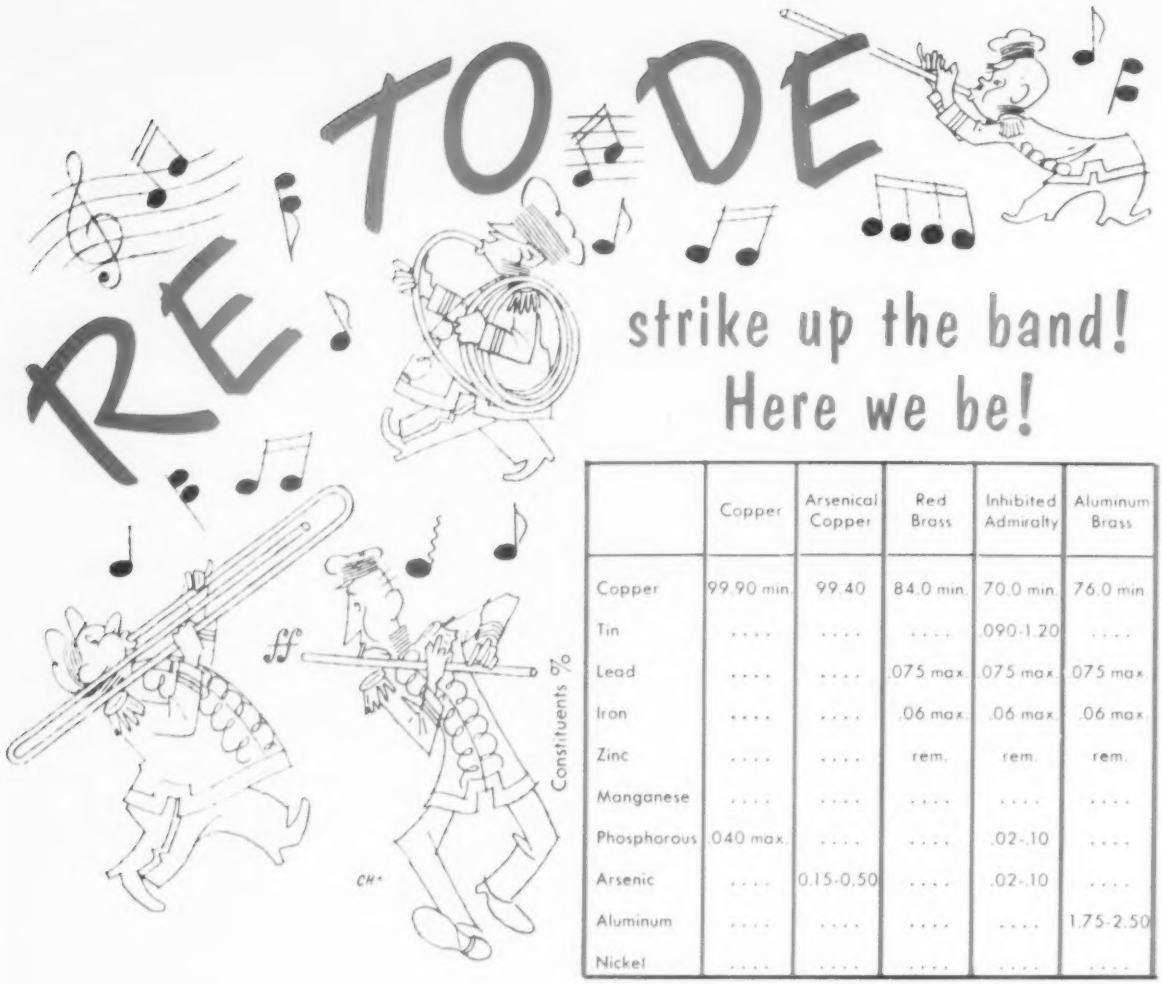
Baltimore 3, Maryland
caustic soda • soda ash • chlorine • sulphur • bicarbonate of soda
dry ice and carbonic gas • ammonia • sodium nitrate • nitric acid
hydrazine products • sodium methylate • sodium chlorite • hypochlorite
products • sulphuric acid • ethylene glycols and oxide • methanol
2063



	Copper	Arsenical Copper	Red Brass	Inhibited Admiralty	Aluminum Brass
Copper	99.90 min.	99.40	84.0 min.	70.0 min.	76.0 min
Tin	....	....	....	.090-1.20	....
Lead	....	....	.075 max.	.075 max.	.075 max.
Iron	....	....	.06 max.	.06 max.	.06 max.
Zinc	....	....	rem.	rem.	rem.
Manganese	....	....	....	....	....
Phosphorous	.040 max.	....	....	.02-.10	....
Arsenic	....	0.15-0.50	....	.02-.10	....
Aluminum	....	....	....	....	1.75-2.50
Nickel	....	....	....	....	....

RE . . . TO DE . . . . . READY TO DELIVER

Adding the missing letters (indicated by dots) you make the entire line read:

Ready to deliver to you the condenser tubing you require in any of the alloys and popular sizes shown on the chart above.

You'll want to specify Wolverine condenser tubing because its entire manufacture is subjected to more controls than most any other tubing. Every possible attention is paid to wall thickness and lengths, and the tubing undergoes special quality tests before it is released for shipment. Close tolerances, quality testing and special handling (all routine matters with Wolverine) go to make this condenser tubing the outstanding performance-standard in the industry—The tube to specify for dependability . . . Wolverine.

WOLVERINE TUBE DIVISION
of CALUMET & HECLA, INC.

ESTABLISHED 1916

Manufacturers of Quality-Controlled Tubing
1459 CENTRAL AVENUE • DETROIT 9, MICHIGAN

Plants in Detroit, Mich. & Decatur, Ala. *Sales offices in Principal Cities*

EXPORT DEPT., 13 E. 40th ST., NEW YORK 16, N. Y.

if you are a user of steel tube - - -

But to gain the dividend, you must be a user of a particular steel tube—Wolverine Electric-Welded steel tube.

The investment you make in this tube pays extraordinary dividends. Every purchase pays good dividends in the long uninterrupted service the tube provides day after day after day.

The reason it can carry on for an unbelievably long time is because the tube starts with that purpose; it is made to last.

When you buy this carefully-made tube, you buy the accumulated experience of 37 years of specialized tube-making where extremely high standards prevail.

And now all the practices that distinguish the production of Wolverine nonferrous tube are introduced into the manufacture of our Electric-Welded steel tube to make it the most desirable tube of its kind to satisfy your most rigid requirements.

If you want to make a rewarding investment, you'll make a wise choice in specifying Wolverine Electric-Welded steel tube.

½" through 2" O.D. for condenser and heat exchangers.
½" through 3" O.D. for boiler tube.
in these alloys: SAE 1010, SAE 1015, SAE 1020, SAE 1025, SAE 1030.

We invite your inquiries

ESTABLISHED 1916

WOLVERINE TUBE DIVISION
of CALUMET & HECLA, INC.

Manufacturers of Quality-Controlled Tubing
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Plants in Detroit, Mich. & Decatur, Ala. *Sales offices in Principal Cities*

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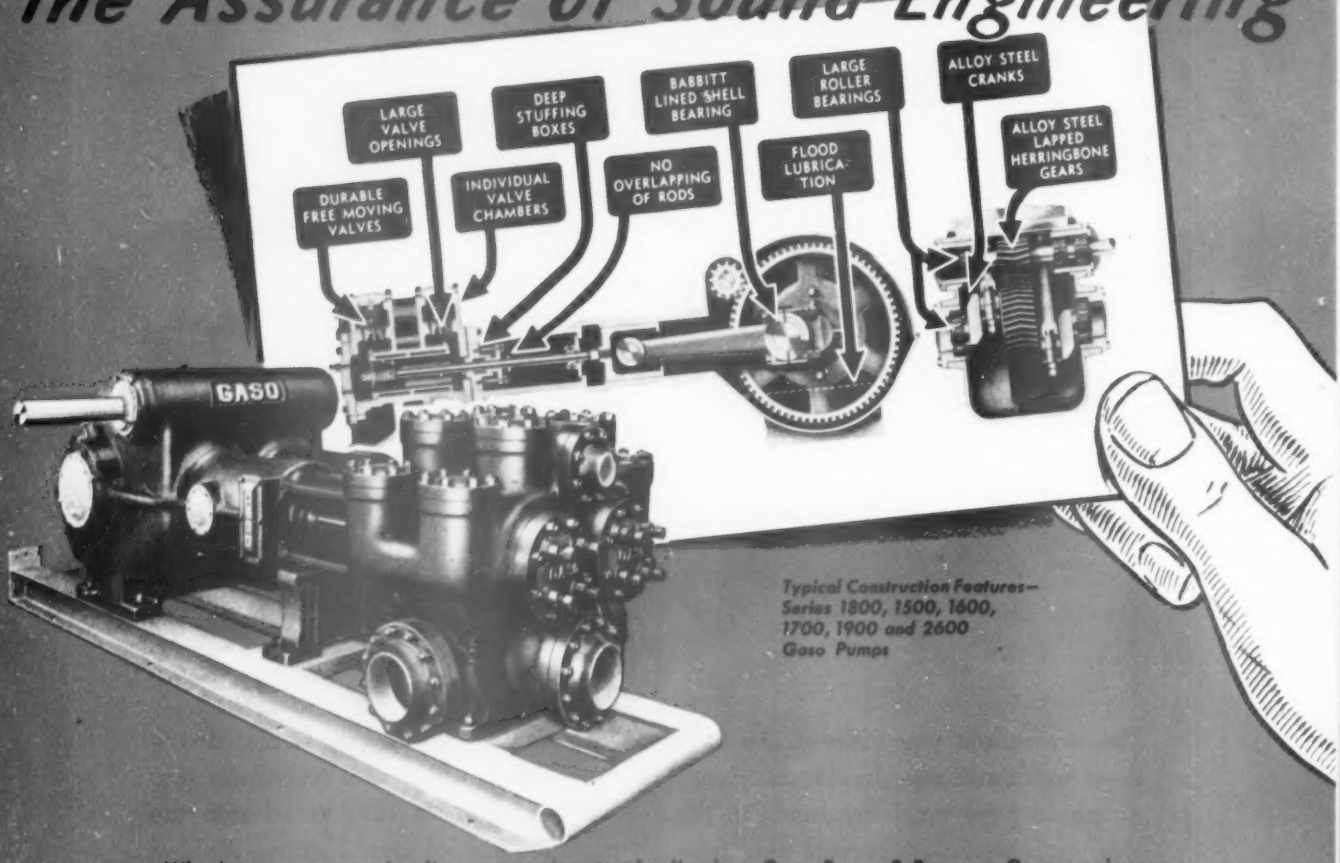
BACK OF EVERY GASO PUMP

the Assurance of Sound Engineering



Typical Construction Features—Series 1800, 1500, 1600, 1700, 1900 and 2600 Gaso Pumps

Why have so many pipe line companies standardized on Gaso Pumps? Because Gaso engineering, developed and refined through nearly 40 years of specialization, gives pipe line men exactly what they look for in pumping equipment—trouble-free, capacity performance for periods of time that extend far beyond the life expectancy of ordinary mechanical equipment.

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BUDA ENGINE & EQUIPMENT CO., Los Angeles, Calif.
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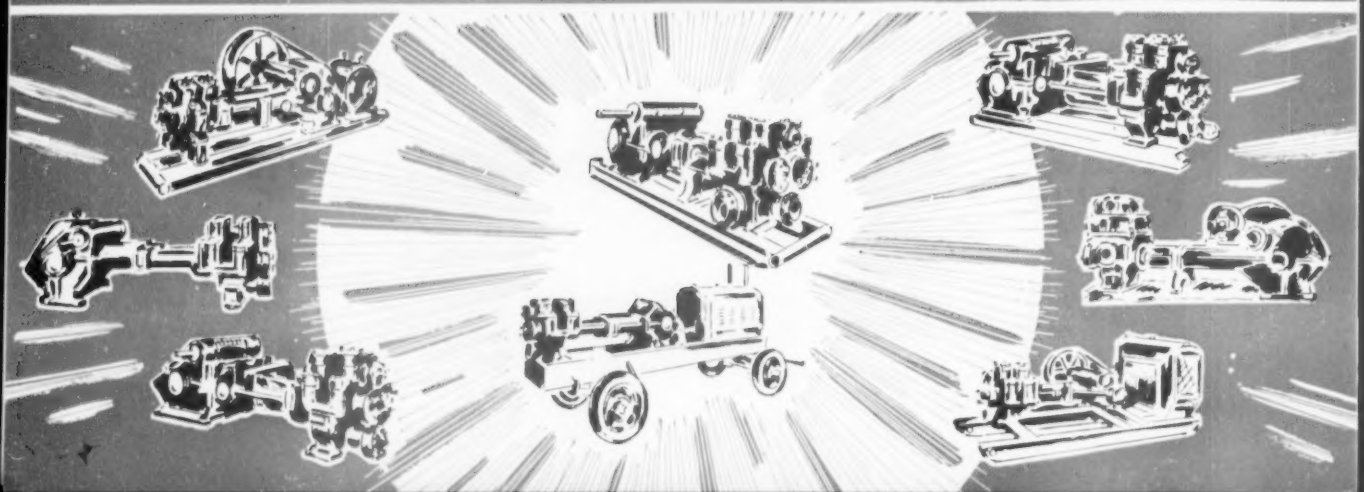
GASO PUMPS

for every oil industry need



from Alaska to Iraq!
from Germany to Japan!

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OIL WELL SURVEYS

EASTMAN is known the world over for the finest in oil field tools and instruments.

You can purchase Eastman equipment for world wide use through our exclusive export representative – the EASTMAN INTERNATIONAL COMPANY.

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Eastman, as a service to its customers abroad, will handle orders for most oil field equipment listed in the composite catalog, combining many transactions under one shipment, license, and letter of credit.

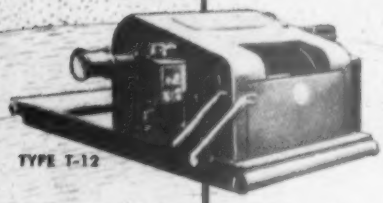
For additional information, address communications to

EASTMAN INTERNATIONAL COMPANY
P. O. Box 1500 Denver 1, Colorado, U. S. A.
Cable Address: EASTCO

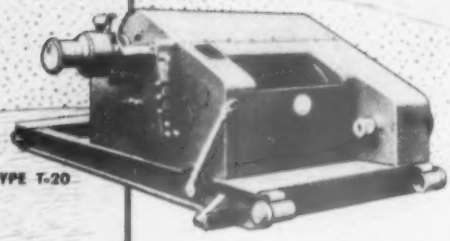
EASTMAN OIL WELL SURVEY COMPANY

LONG BEACH • DENVER • HOUSTON

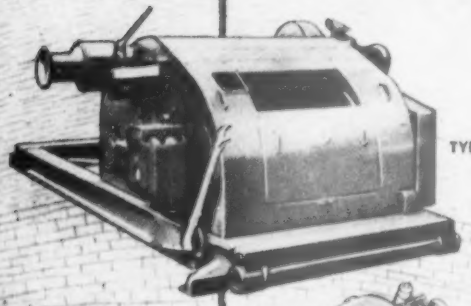
TYPE T-8



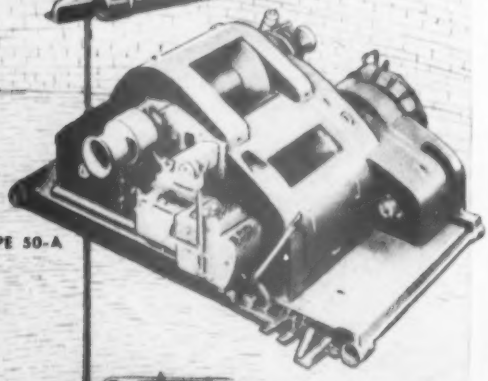
TYPE T-12



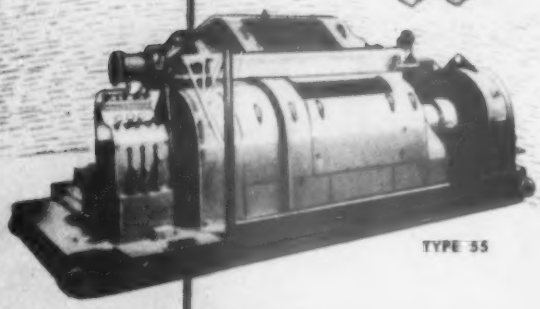
TYPE T-20



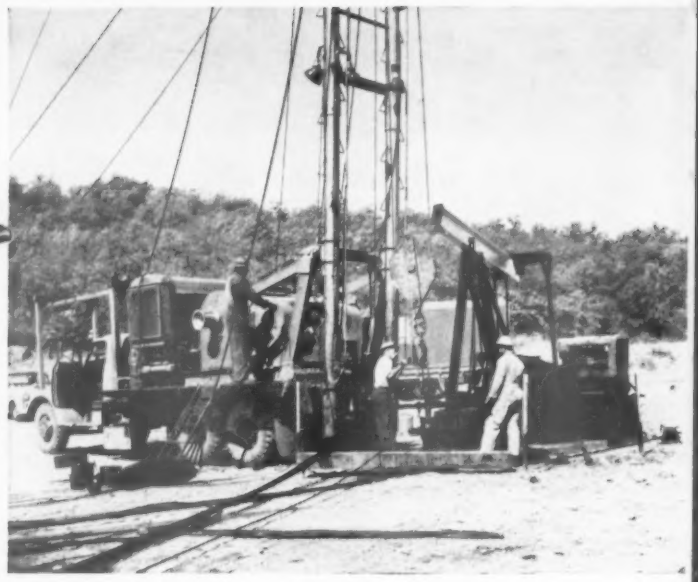
TYPE T-32



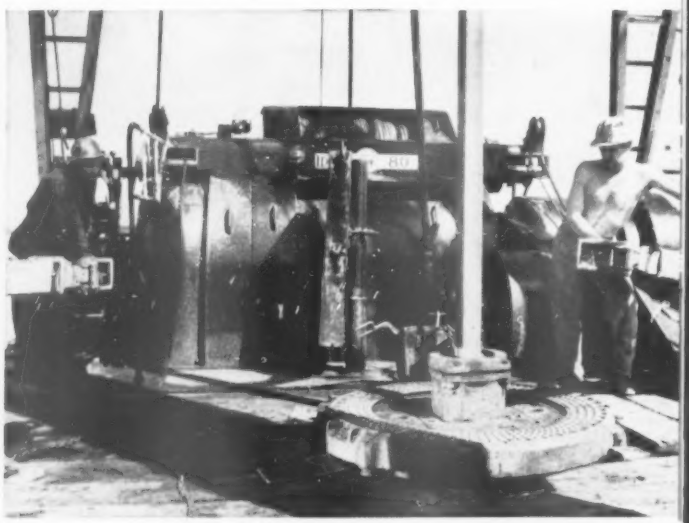
TYPE 50-A



TYPE 55



IDEAL RIGS



Built for drilling
at any depth

To keep its equipment development program closely tied in with the day-to-day requirements of the drilling industry, National's field engineering staff is constantly at work in the major oilfields. Information collected by these equipment specialists makes it possible for National Supply to satisfy every operator's machinery needs for drilling at any depth.

When the Type 160 Consolidated Rig was first introduced, few people expected to use so much drilling capacity. But the ever-increasing depth range has made the "Ideal" Type 160 an increasingly important factor in the industry.

At the other end of the scale, four sizes of "Ideal" hoists and rigs provide efficient, easily portable equipment for servicing, workover, and shallow-well drilling. Many units of this type are truck or trailer mounted to facilitate their mobility, and reduce rigging-up time.

Between these largest and smallest units are the other members of the complete family of "Ideal" Drilling Rigs, with Superior Drilling Engines and Ideal Drive Groups. As a result, operators can purchase *from a single reliable source* machinery which is designed and built to work together for drilling at any depth.

New bulletins and brochures are now available covering single units for specific requirements, as well as comprehensive bulletins on portable rigs, control and drive assemblies, and related "Ideal" equipment. Why not write for this latest information and bring your National literature file up to date?

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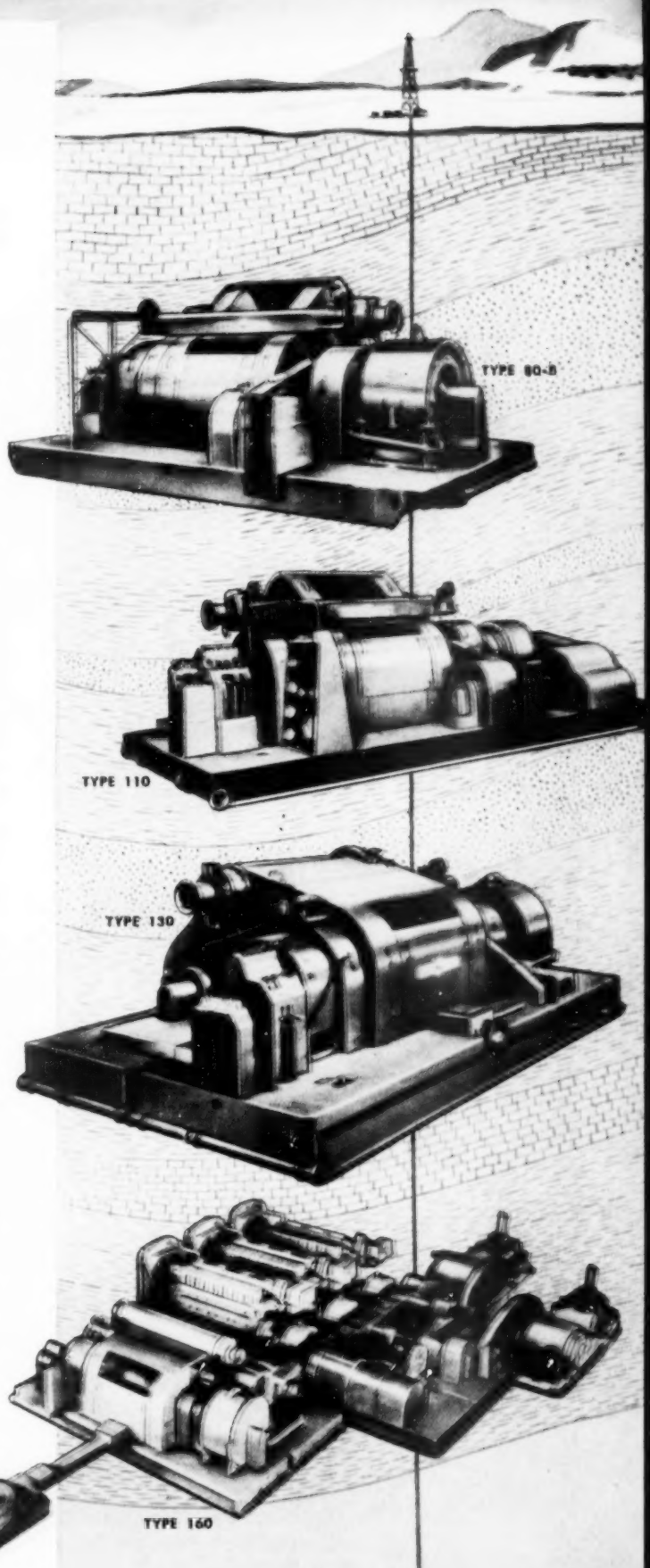
DIVISION OFFICES: Denver • Ft. Worth • Houston • Pittsburgh Tulsa • Torrance

CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta

EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London, E.C. 2

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT

SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES



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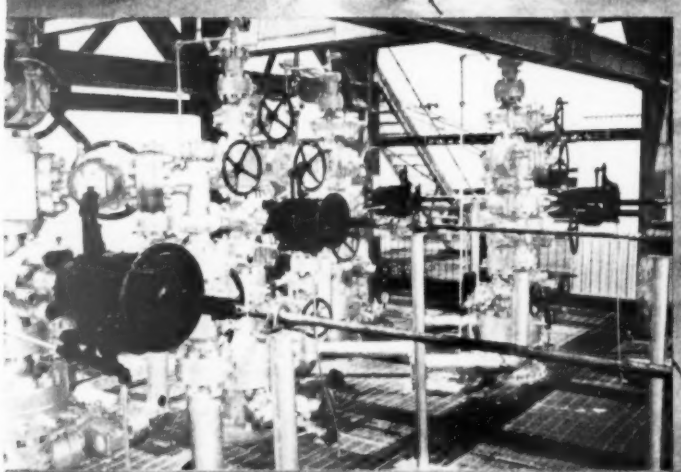
for that big one off shore

E-I-M

stands the Test...



It's just like fishing with a heavy test line when you install E-I-M Valve Controls. You can be sure that the well won't get away from you because E-I-M has a record of safety and dependability. Our engineers can solve your transmission problems with E-I-M Valve Controls for oil or gas lines off shore or across the continent.

The Pure Oil Company's platform in Rollover Field, 9 miles off the Louisiana coastline, has four producing wells, each using an E-I-M Valve Control for maximum safety to protect personnel and the platform.

E-I-M *Company* INCORPORATED

1340 OLD SPANISH TRAIL • HOUSTON 21, TEXAS • MOhawk 4587

Valve Controls • Speed Reducers • Cooling Tower Drives • Control Valves

THESE TWO EXAMPLES SHOW YOU

What Nordstrom Means by "Lubricaut

Nordstrom three-way Transflo valves on relief service at top of propylene tower separating propylene from propane.

TYPICAL NORDSTROM REFINERY APPLICATIONS

- Catalytic Polymerization
- Crude Topping and Vacuum Distillation
- Fluid Catalytic Cracking and Gas Recovery
- Distillate Recovery in Cycling Plants
- Duo-Sol Solvent Extraction
- Houdriflow Catalytic Cracking and Gas Recovery
- Light Ends Fractionating
- Thermal Cracking
- Phenol Extraction
- Propane Deasphalting
- Cycloversion
- Delayed Coking
- Girbotol Process
- Propane Dewaxing
- Hydroforming Process
- Naphtha Polyforming
- Solexol Process
- Solvent Dewaxing
- Thermal Reforming

Nordstrom has compiled a series of specification sheets for each of these processes, showing recommended materials, pressure classes, lubricants and valve figure numbers. Ask your Nordstrom sales engineer to review them with you.

TYPICAL NORDSTROM PROCESS INDUSTRY APPLICATIONS

- Beverage Plants
- Cement Plants
- Chemical Plants
- Explosives
- Food Plants
- Gas Plants
- Ice and Refrigeration
- Paint and Lacquer
- Paper and Pulp
- Pharmaceuticals
- Power and Steam Plants
- Rubber Plants
- Sewage Plants
- Smelters and Mines
- Soap Factories
- Steel Mills
- Sugar Refineries
- Synthetic Ammonia
- Synthetic Fibers
- Synthetic Plastics
- Synthetic Rubber
- Tanneries
- Textiles and Dyes
- Water Works

The new Nordstrom Corrosion-Resistant Valve Bulletin V-217 will make it easy for you to fit the right valve to each service. Write for a copy, Rockwell Manufacturing Company, Pittsburgh 8, Pa., or ask your Nordstrom sales engineer.

-Sealed for POSITIVE SHUT-OFF"

Here are two typical Nordstrom valve process applications—one is a propylene tower, the other a dry hydrogen line.

They illustrate an important point in specifying valves for process service . . . if really tight shut-off of hard-to-hold gases or fluids is important, no valve can do the job better than Nordstrom.

Why? Because Nordstrom is the original lubricated plug valve. Nordstrom is the valve with the extra seal of plastic lubricant around the valve ports to check seepage of even the lightest, most penetrating substances.

That, of course, means greater safety, and greater economy, too, because when leakage is prevented, valve life is far longer. And most important, it means uninterrupted operation of continuous process units—no down-time for avoidable valve repairs.

The same lubricant that seals, also keeps the valve ready to operate in an emergency.

Nordstrom valves are built in a wide range of sizes, pressures, special metals and body designs for the process industries, including three- and four-way designs for batching, blending and switching. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

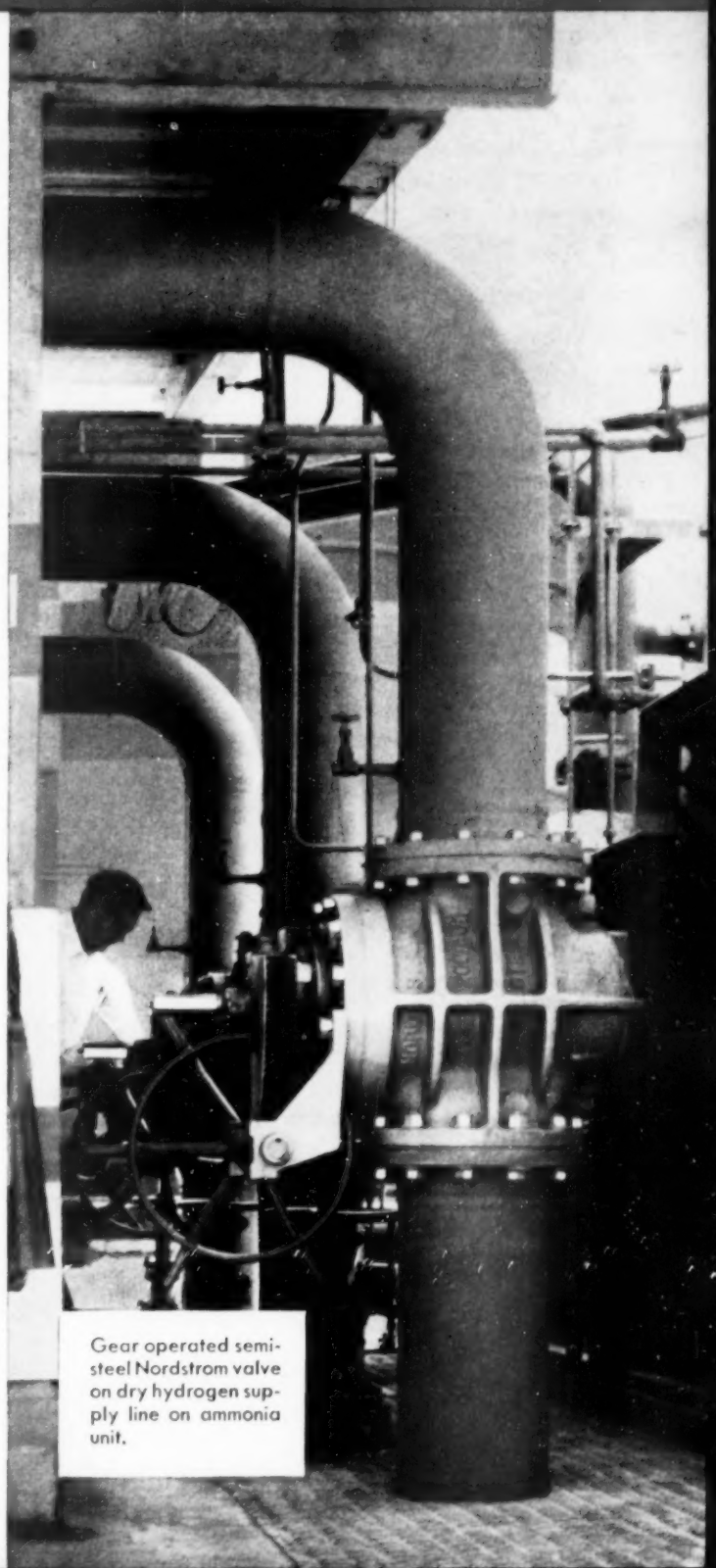
Canadian Licensee: Peacock Brothers Limited.

ROCKWELL Built

Nordstrom Valves

Lubricant-Sealed for Positive Shut-Off

Another ROCKWELL Product



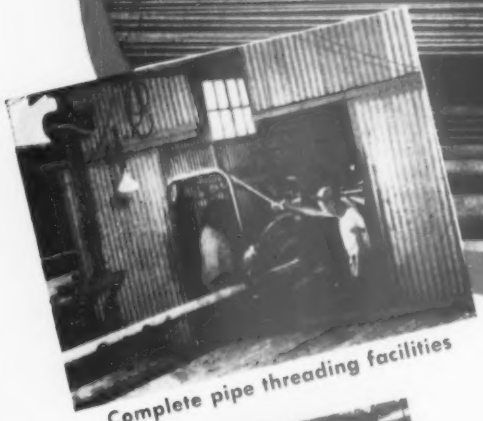
Gear operated semi-steel Nordstrom valve on dry hydrogen supply line on ammonia unit.

complete pipe facilities . . .

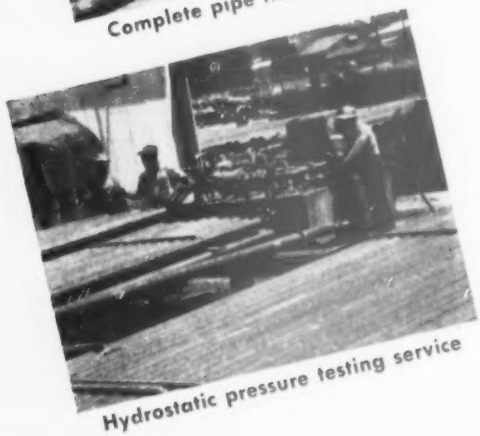
Remember to call

TEX-TUBE

First



Complete pipe threading facilities



Hydrostatic pressure testing service

This new pipe runway and loading crane is a further step in Tex-Tube's progress in becoming a leading pipe supplier for the Southwest.

Tex-Tube carries a complete stock of pipe and tubing for all industries for fast, dependable delivery on all your pipe needs.

TEX-TUBE INC.

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Chemicals you live by

YOU CAN'T LOSE

When you bet on DIAMOND chromates and bichromates to help stop corrosion, everything is in your favor.

By using these DIAMOND Chemicals, the life of drill strings may be increased 5 to 7 times. At one producing well where careful records were kept, treatment with DIAMOND Chromates slashed operating costs from $550-$650 per month to $75-$150.

Many other DIAMOND Chemicals are at work saving money for the oil industry: carbon tetrachloride, bicarbonate of soda, caustic soda, chlorinated paraffins, chlorine, silicate of soda and several specialties.

You have everything to gain, nothing to lose, if you let your nearby DIAMOND representative give you the details. Isn't it worth a phone call?

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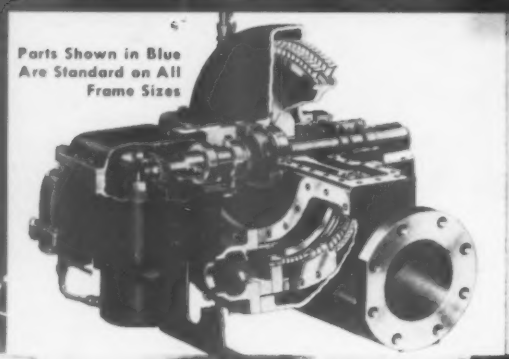
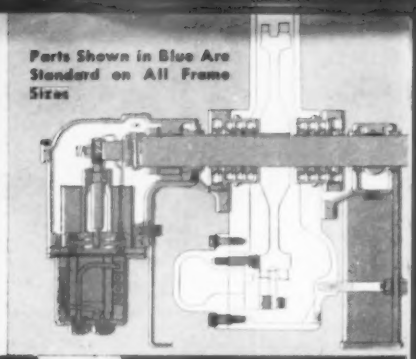
Diamond Chemicals for the Oil Industry

DIAMOND ALKALI CHEMICALS





This display of interchangeable parts on G.E.'s Type DP turbine covers over 85% of the parts subject to wear—means you tie up less money in inventory.

ANOTHER PLUS VALUE OF G-E MECHANICAL-DRIVE TURBINES...

85% Interchangeability of Turbine Parts Means Less Money Tied Up in Inventory

Over 85% of the wearing parts are interchangeable among General Electric's Type DP Turbines—regardless of turbine rating. This means you don't have to tie up a lot of money stocking spare parts for each turbine; one set of parts protects a whole line-up. This feature alone can save you up to $100.00, even in installations of just two turbines of different sizes. Greater savings, of course, accrue as the number of turbines in the plant increases.

All of the parts, except for the governing end, are also interchangeable between G.E.'s Type DP Mechanical-drive Turbine and the Type DR which is designed for slightly wider speed range and greater horsepower.

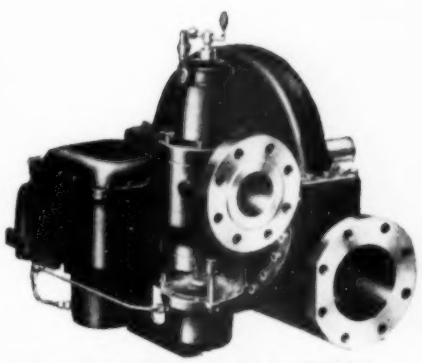
This interchangeability is just one of many DP features which save you money. The chart below indicates other areas of savings.

Remember—the total cost is often more than just the sales price. But G.E.'s standard DP turbines include the extra features that save you extra costs. For more information contact your nearest G-E Apparatus Sales Office. Write for bulletin GEA-4955A, "A New Standard in Mechanical-drive Turbines." General Electric Company, Schenectady 5, N. Y. 252-65

GENERAL ELECTRIC

INSTALLATION AND MAINTENANCE COST-SAVING FEATURES

THESE EXTRA FEATURES, STANDARD ON ALL G-E TYPE DP TURBINES, CAN . . .	Save You up to
COMBINED TRIP-THROTTLE VALVE Eliminate extra cost of buying and installing valve ahead of the turbine.	$200.00
SINGLE RESERVOIR FOR COOLING LUBE OIL Eliminate extra cost of piping cooling water to and between bearings.	50.00
MAJORITY OF PARTS INTERCHANGEABLE One set of spare parts protects several units—less money tied up in inventory.	100.00
METALLIC-LABYRINTH VALVE STEM BUSHING Eliminate labor costs of replacing soft packings; cut down-time production losses.	50.00
SHAFT MONEL-SPRAYED AT PACKING FIT Saves frequent cost of purchasing and installing carbon rings; contributes to long shaft and packing life.	20.00
ESTIMATED TOTAL SAVINGS	$420.00



G-E Type DP Mechanical-drive Turbine

COMPARE THE FEATURES
EVALUATE ALL THE COSTS

See why G-E Standard Type DP turbines are your most economical buy.

NOW

Great New Line of FWD Trucks with MATH-O-MATIC DESIGN

A significant engineering achievement which puts the power where there's work to be done by properly proportioning weight and torque

FUNCTION-ALL STYLING for easy mounting of snow-plows, underbody blades, dump bodies and other equipment. Choice of crown or military-type fenders.

RIGI-TAPERED FRAME—25% stronger. Heat-treated alloy steel. Deep taper design *rigidizes* front end for mounting plows and other equipment, distributes load over entire frame.

REAR AXLE—30% stronger. Full-floating. Diameter increased from 1,812 to 2,000.

POWER PROPORTIONING CENTER DIFFERENTIAL—Not only power on *all* wheels, but properly proportioned power for maximum performance at minimum operating cost.

EASY-ACCESS HOOD—Removable side panels and "butterfly" hinged top sections permit instant access to engine, despite close-mounted auxiliary equipment.

TRUNION-MOUNTED RADIATOR—Floating construction, isolated from frame by rubber. Takes the tough shocks without cracking core, shell or hood.

VALVE-IN-HEAD ENGINES in all trucks—light weight, high power output. Diesel engines available for all models.

CUSHIONED ENGINE MOUNTINGS—"Fourmaster" and "Sixmaster" series engines are three-point rubber mounted; quieter, vibration-free.

12-VOLT ELECTRIC SYSTEM—Quick power-surge for cold weather starting; hotter spark; less loss of current under heavy lighting loads.

HEVI-DUTY STEERING GEAR and linkage assures positive control under roughest operating conditions. Power steering optional on all models.

COMFORT CAB—Lots of leg room. Picture-window visibility. Cab-hood is three-point rubber mounted. Adjustable seat, of light, strong tubular frame construction. Tip-out instrument panel for easy access.

STIRRUP-ACTION CLUTCH & BRAKES—Power assisted brakes, hydraulically assisted clutch. Suspended design of both pedals for easier servicing . . . provides "stirrup" action for greater leverage.

POWER OPERATED CENTER DIFFERENTIAL LOCK—FWD Center Differential Lock manually controlled but power-actuated. Red dashboard light warns when lock is on.

FWD MATH-MATIC DESIGN *for*

GREATER ECONOMY*—30 to 37% more tire wear! GREATER PERFORMANCE*—40 to 82% more tractive ability! GREATER SAFETY*

Now, it's top truck performance at minimum operating cost, thanks to exclusive FWD Math-Matic Design, the most important advancement in 43 years of heavy-duty truck leadership. Now, it's an all new line of FWD "Fourmaster" and "Sixmaster" series trucks with the widest range of G.V.W.'s in the industry . . . plus many other big features to give you more service for your truck dollar.

THE FOUR WHEEL DRIVE AUTO CO.
CLINTONVILLE, WISCONSIN • Canadian Factory KITCHENER, ONTARIO

* TRUCK RESEARCH PROJECT conclusions. For detailed data on 7 years' research conducted by the University of Wisconsin's College of Engineering, write now for your free copy of "The Truck That Went to College."

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NOW... See your FWD dealer. He knows!

MATH-O-MATIC DESIGN

Six SPHERICAL SEPARATORS

Each Handling

80 million CFPD

PEERLESS-SPECIALISTS in the SEPARATION of LIQUIDS and GASSES!

At a huge underground gas storage project in Pennsylvania, you'll find the SIX specially built PEERLESS SPHERICAL SEPARATORS, as pictured above. All compressed gas passes through these separators to prevent condensate from getting to the dehydration plant load and upsetting the schedule. These SIX PEERLESS SEPARATORS are good for 1,500 PSIG working pressure and are designed to pass 80 million CFPD each at 450 PSIG.

This is just another installation typical of the many applications of PEERLESS SEPARATION EQUIPMENT.

PEERLESS MFG. CO.

PEERLESS MANUFACTURING CO.

P O BOX 7193 ★ DALLAS, TEXAS ★ DIxon 8431

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Here's Republic's

EASY TO JOIN. Republic Plastic Pipe installation costs are low because field joints are easily made. There are plastic fittings available for many types of piping arrangements, including adapters for joining plastic to steel. Semi-Rigid is joined by a solvent welded sleeve type fitting. Flexible joints are made using insert type fittings and stainless steel clamps.

New PLASTIC PIPE

Republic Steel offers two new products that may solve some of your piping problems. They are Republic Semi-Rigid and Republic Flexible Plastic Pipe.

Semi-Rigid is made of butyrate, a material known for its high corrosion-resistance to petroleum products. You can use it for many kinds of flow lines including transmission of high paraffin crudes, sour crudes and salt water. You can also transmit low-pressure gas, sweet or sour.

Republic Flexible Plastic Pipe is made of polyethylene. Its oil field uses include water lines to drilling rigs and other cold water applications. It is not suitable for handling petroleum products.

Both of these plastic pipes have exceptionally smooth wall surfaces. This means a high rate of flow, reduced friction loss, low maintenance costs. Both are non-toxic. Both are lightweight. They're exceptionally easy to install. In-the-ground costs are surprisingly low.

Semi-Rigid is available in 9 sizes from ½″ to 6″. It comes in 20 and 40-foot straight lengths. It's available in coils in ½″, ¾″ and 1″ diameters. While normally supplied in black, clear pipe is available on request. Flexible also comes in 9 sizes, from ½″ to 6″. It's available in coils, in sizes ½″ through 3″ in diameter. In 4″ and 6″ diameters it is supplied in 25-foot lengths.

New Booklet No. 603 gives sizes, lengths, test pressures and other valuable information on Republic's new Semi-Rigid and Flexible Plastic Pipe. Write for it. It's Free.

Complete information on both of these new Republic Plastic Pipes is available in booklet No. 603. Write for it to:

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

REPUBLIC STEEL

Republic
PLASTIC PIPE
SEMI-RIGID AND FLEXIBLE

RECOMMENDED LINE-UP

for smoother, surer valve performance!

Here's why...

Only in Darling cast steel pipe line gate valves do you have the advantage of Darling's fully revolving double disc parallel seat principle . . . and what a difference!

For example, field experience proves time and again that this feature successfully compensates for valve body distortion. There's tight, *easy* closure—regardless!

And on top of that, disc and seat wear is kept *uniform.* So these key parts just naturally last longer!

Think what these advantages mean in smoother, surer performance . . . in *lower cost* operation and maintenance! But get *all* the facts! Helpful, fully descriptive bulletins are yours for the asking.

FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN

SEND FOR DATA

Darling Parallel Seat Gate Valves come in a wide range of sizes and types for all gas and oil line requirements. Simply outline your particular service needs or ask for a complete descriptive bulletin.

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

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It will pay you to find out what Mack six-wheel trucks can do to save money and boost profits on your job through unfaltering traction and faster, uninterrupted schedules.

That's because only Mack six-wheelers boast the unique advantages of Mack's exclusive Balanced Bogie and Power Divider . . . with all the benefits they give you in maximum flexibility, even tire loading, uniform braking, simplicity of design and positive traction regardless of the toughest terrain.

Write to us today for your free copy of booklet describing the Mack Balanced Bogie with Power Divider, or contact your nearest Mack branch or distributor.

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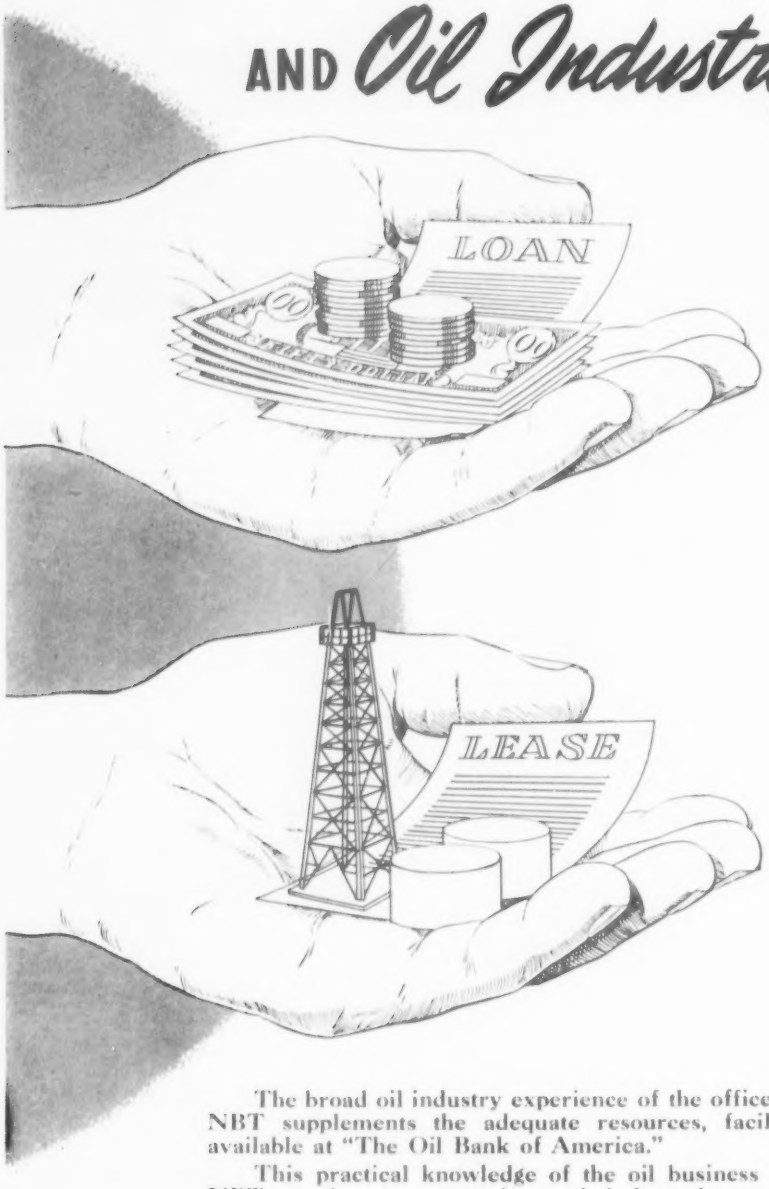
Mack Trucks, Empire State Building, New York 1, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

Special Banking Service AND *Oil Industry Financing Go* HAND *in* HAND *at*



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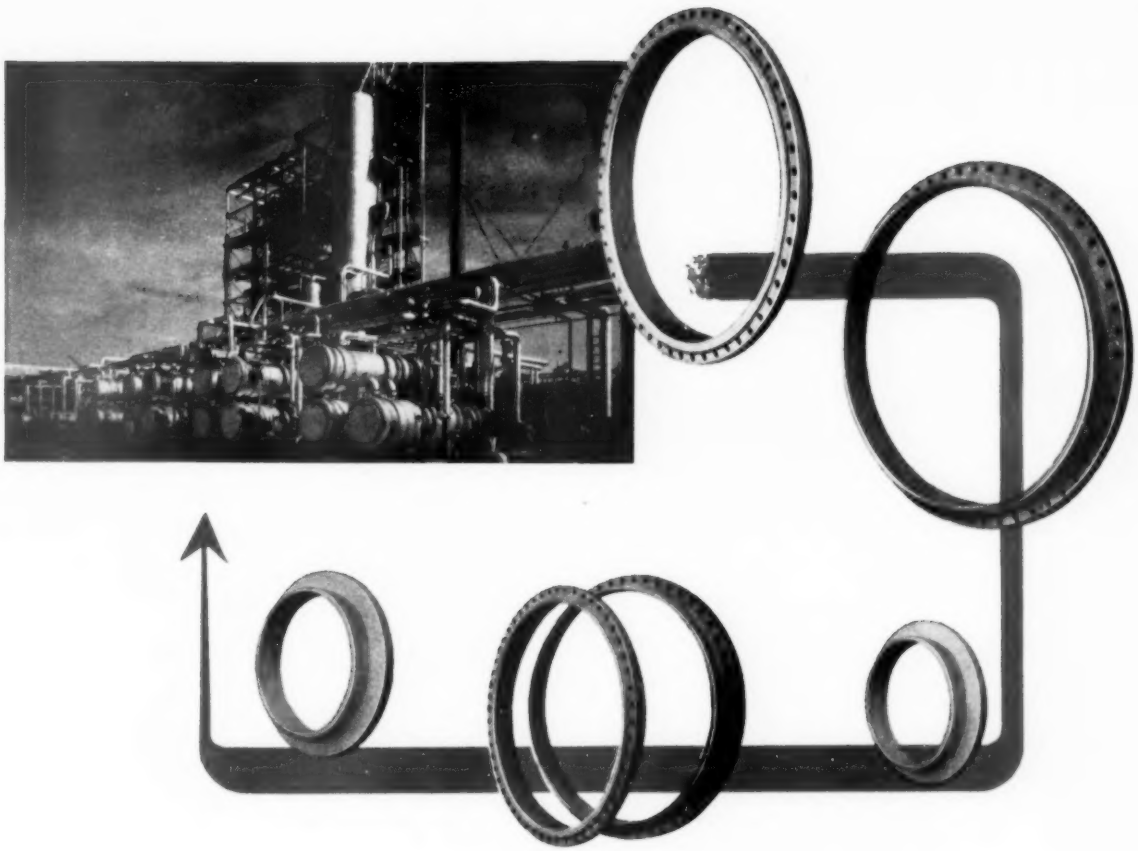

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Railway Steel flanges are made from carbon and alloy steels for just about every job in the petroleum, chemical, petrochemical, and gas industries where large-diameter flanges are required . . . all the regular standard types of flanges, as well as special types, including those built to TEMA standards. Railway Steel flanges are available in a wide range of sizes and types from 18 in. ID to 150 in. OD.

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Sales representatives in Chicago, Cleveland, Houston, New York, Richmond, San Francisco, St. Louis, St. Paul and Tulsa* will be glad to provide complete information about these superior flanges for your applications.

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Brake rims, gear blanks and other circular forgings are also available for many types of service. Use of our own steel assures complete dependability and long service life.

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AMERICAN LOCOMOTIVE COMPANY

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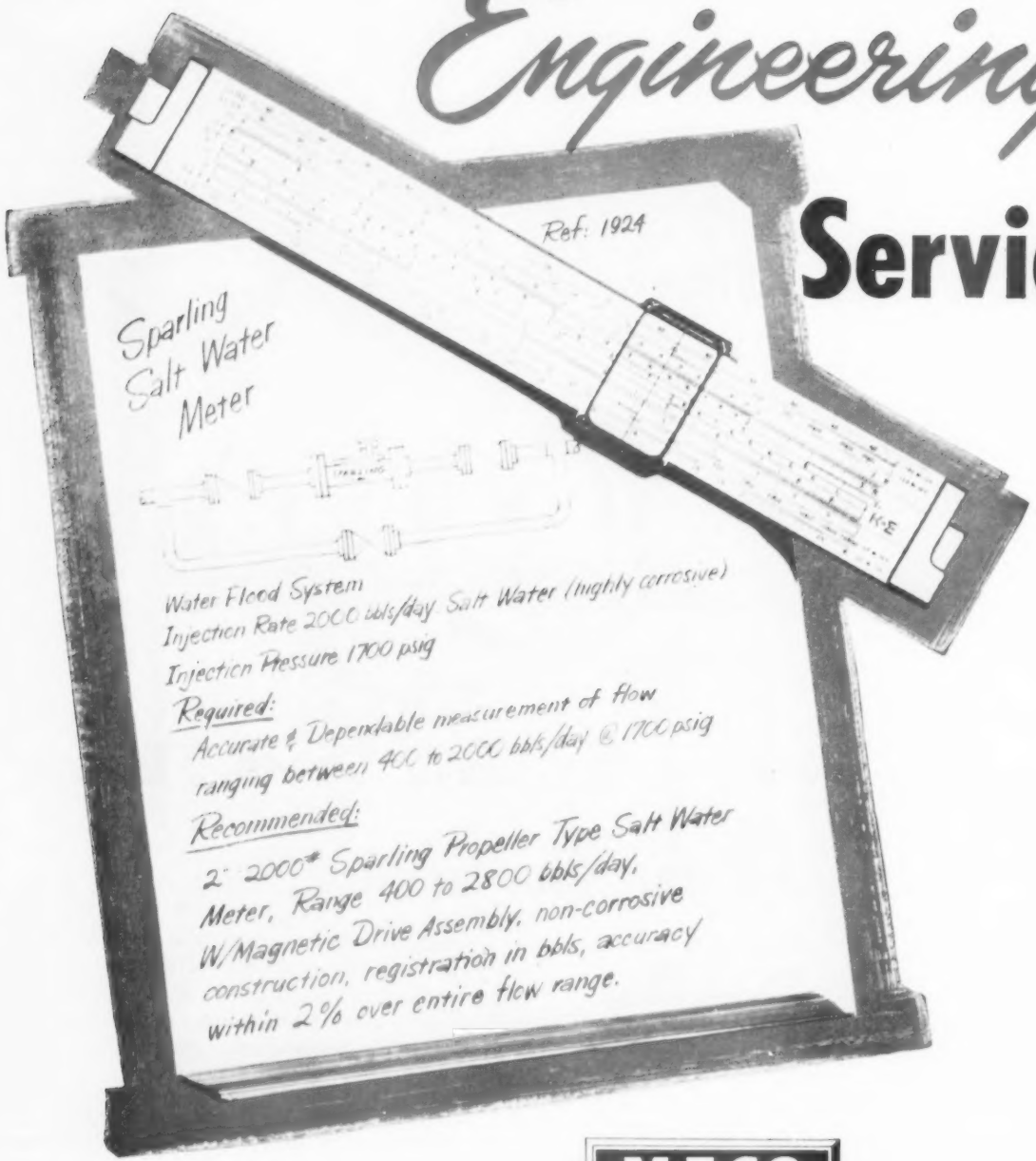
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Salt Water
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Injection Pressure 1700 psig
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Accurate & Dependable measurement of flow
ranging between 400 to 2000 bbls/day @ 1700 psig
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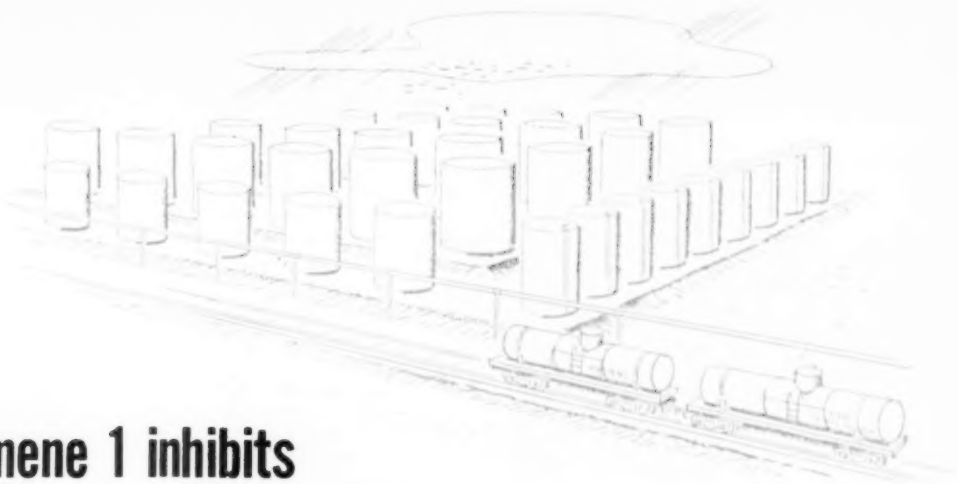

Tenamene 1 inhibits gum formation for as little as ¼¢ per barrel of gasoline

Tests under tough varying plant conditions show that Tenamene 1 is the most effective low-cost gum inhibitor known to the petroleum industry.

Refiners find that a little Tenamene goes a long way. In a typical case, only 5 pounds of Tenamene 1 are needed to treat 1000 barrels of gasoline—that's effective protection against gum for approximately ¼¢ per barrel!

If you're interested in general information about gum inhibiting as well as specific data about the Tenamenes, send for the booklets listed in the coupon. Our Petroleum Chemicals Laboratory will be glad to make tests and recommendations on any of your gum inhibiting problems.

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Gentlemen: Send me copies of your booklets: "Inhibiting Motor Fuels with the Tenamenes" and "Tenamene 2 Inhibitor Sweetening."

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Sales representative for **TENNESSEE EASTMAN COMPANY,** division of **EASTMAN KODAK COMPANY**

How to get maximum tube life per dollar: Ask the experts!

This month's report is on: **SICROMO 7**

Suggested as a substitute for steels of the 5.0 per cent chromium type for applications which require increased resistance to corrosion by hot petroleum products.

ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

Carbon	Sicromo 2	Sicromo 5S	18-8 Ti
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DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-20*
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DM	4-6% Cr.-Mo.	18-8 Stainless	35-15**
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	16-25-6**

** Available as seamless tubing on an experimental basis only.*
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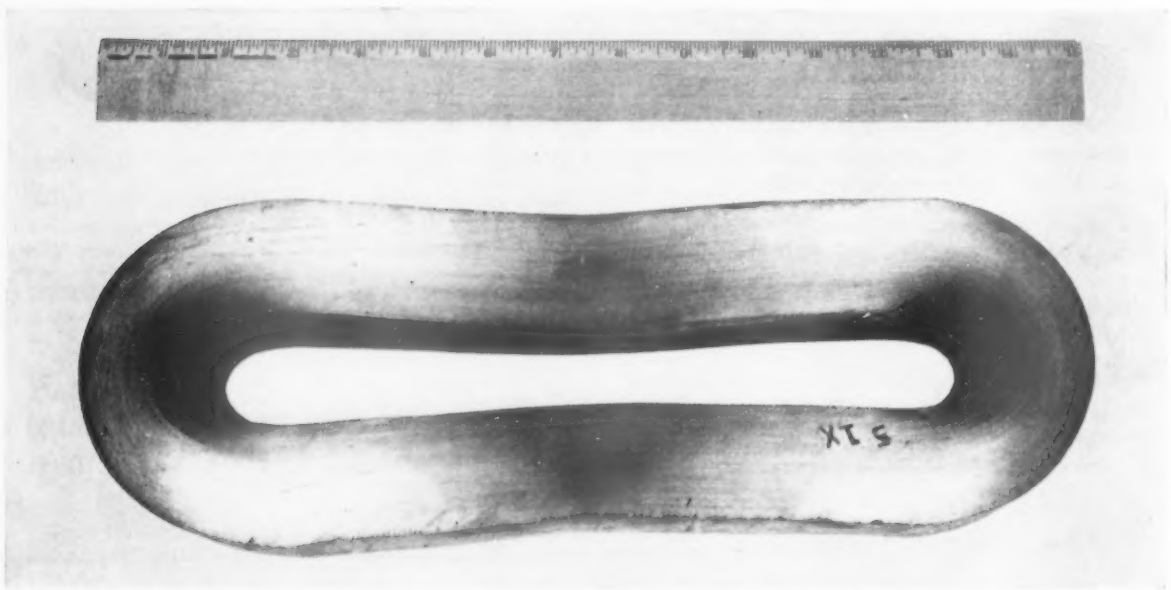
Let our "RSQ"—Research, Supply, Quality—solve your tube problems. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



Flattened test of 10½" O.D. by 1.580" wall of 18-8 Cb showing the excellent ductility of large, heavy-wall Timken seamless tubing.

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DU PONT

PETROLEUM CHEMICALS DIVISION NEWS

DU PONT

December ★ One of a Series of Interest to the Petroleum Industry ★ 1953

Use of Antioxidants Cuts Sweetening Costs

With operating costs continuing to rise and the consumer gasoline market becoming more competitive every day, you are probably looking for every possible opportunity to cut production costs—without sacrificing quality.

The use of antioxidants for sweetening offers just such an opportunity. If you are starting from scratch, the initial cost is low because a minimum of equipment is required to set up the operation. Or, if you employ existing equipment, the cost of revamping is exceedingly low since antioxidant sweetening is a simple procedure.

Operating costs are lower, too, because the use of Du Pont Antioxidant No. 22 reduces regeneration expenses and the need for additional chemicals.

Other Advantages

Since antioxidant sweetening does not require the use of sulfur or copper, the chance of contamination from these elements is eliminated — unless the gasoline comes in contact with them in some other way.

And since Du Pont Antioxidant No. 22 is highly effective as a stabilizer, you can combine two important steps into a single, inexpensive operation when you use this additive as a sweetening agent.

No Gasoline or Octane Loss

Some sweetening methods result in a definite loss of gasoline or octane number. But there is no loss of either product or quality when Du Pont Antioxidant No. 22 is used in the sweetening process.

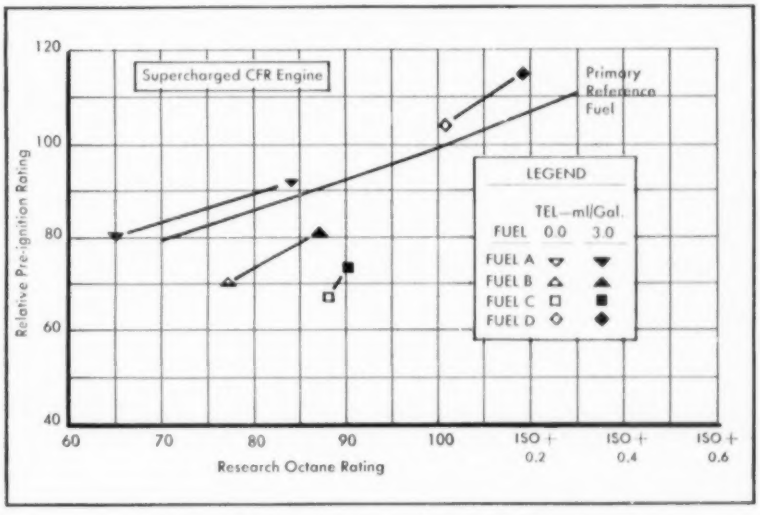
Du Pont Antioxidant No. 22 is N:N'-di-secondary butyl-para-phenylenediamine. Samples of it and additional information on antioxidant sweetening are available through any Du Pont Petroleum Chemicals Division district office.

You can reduce both knock and pre-ignition with one additive

Recent tests at the Du Pont Petroleum Laboratory show that TEL not only inhibits the reactions leading to knock, but also the reactions causing pre-ignition

With the compression ratios of automobile engines steadily rising, the problem of finding methods to eliminate or suppress pre-ignition is becoming increasingly important to the petroleum industry.

To help refiners solve this problem, extensive research in pre-ignition is now being done at the Du Pont Petroleum Laboratory. Much useful information has already been developed.



This chart shows the increased resistance to knock and pre-ignition due to the addition of tetraethyl lead in several fuels.

So far, the solution to the problem has been sought in the following two ways:

1. Reducing the tendencies of combustion chamber deposits to glow and cause surface ignition of the charge.
2. Improving the ability of fuels to withstand ignition by such hot surfaces.

Reducing Glow

Certain additives reduce deposit glow and therefore offer one solution to the problem. However, as engine compres-

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OVER

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED *Pre-ignition*

sion ratios are increased still further, it may also be necessary to increase the pre-ignition resistance of the fuels themselves.

Resistance of Fuels

Some hydrocarbons have a greater tendency to be ignited by hot deposit particles than others. Preflame reactions also tend to sensitize the fuel to ignition.

Effect of TEL

The effect of these preflame reactions can be minimized by raising the octane rating of the fuel with tetraethyl lead. In this way, *tetraethyl lead* not only prevents knock . . . but *also reduces the tendency for the fuel to be ignited by a hot surface.*

More Information

More complete details on the Du Pont Petroleum Laboratory's pre-ignition studies are now available to you through any Du Pont Petroleum Chemicals Division district office. Ask for papers entitled "Pre-Ignition in Automotive Engines" and "An Investigation of Pre-Ignition in Engines."

New Lube Oil Show to Help Marketers Stimulate Dealer Promotion

A new lube oil presentation for dealer meetings is now being made available to oil marketers by the Du Pont Petroleum Chemicals Division.

It is especially designed to help you impress your dealers with the value of promoting more frequent oil changes. The same "flannelboard" visual-aid technique as used for the highly successful Du Pont-designed *Brand Name* program is employed for putting across this new promotional tool.

The general theme of the show is: "Good oil seldom wears out . . . but it can become dirtied to death." The individual points emphasized in the presentation can be personalized to bring out the special quality features of your own brand of motor oil.

If you are interested in having one of these personalized lube oil presentations made up for use in your own dealer meetings, we suggest that you talk over the details with a Du Pont Petroleum Chemicals Division representative.

Assistant West Coast District Manager

WILLIAM B. GEST, recently appointed assistant manager of the Petroleum Chemicals Division's West Coast district, has been with the Du Pont Company since 1941.

Until 1945 he served in various engineering capacities at a number of Du Pont-operated government ordnance plants. He then spent two years doing cost engineering work in the Engineering Division and at several company plants.

He joined the Petroleum Chemicals Division in 1947 as a sales-service representative.

Mr. Gest studied engineering and military explosives at Ohio State University, where he also received a B.S. degree in Business Administration.

WILLIAM B. GEST

Du Pont Test Cars Show How to Take the "Toll" Out of Toll Roads

Super highway toll roads and fuel test cars have both been around for a long time.

But it took the ingenuity of a major oil company to put the two together and come up with some amazing results.

When the Garden State Parkway in New Jersey was opened last summer, two Du Pont test cars were on hand for the official opening ceremony. Their job, however, was far more important than merely looking decorative in the official caravan.

Sponsored by one of the large oil companies marketing in the New Jersey area, the cars were used to show the Highway Authority how the new parkway saves the motorist 40% on gasoline mileage and at least 25% in time when compared with the old traffic-congested route.

After the results of the test had been tabulated, the Garden State Highway Publication declared that motorists will save more than the parkway toll by using the new road because of the gasoline savings it makes possible.

LITERATURE AVAILABLE

Here is a partial listing of the bulletins, reports, booklets, technical papers and aids available to you through any of the Du Pont Petroleum Chemicals Division district offices listed below:

Pre-Ignition in Automotive Engines — This paper discusses mainly the glowing tendencies of combustion chamber deposits and the pre-ignition tendencies of individual hydrocarbons Serial A-5652

An Investigation of Pre-Ignition in Engines—A comprehensive discussion of how compression ratios and other mechanical factors affect pre-ignition. Also the effect of tetraethyl lead in reducing pre-ignition Serial A-5756

Du Pont Fuel Oil Additive No. 2—A 12-page bulletin describing this ashless stabilizer and dispersant which prevents clogging of fuel oil screens Serial A-5201

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A-6350

Printed in U.S.A.

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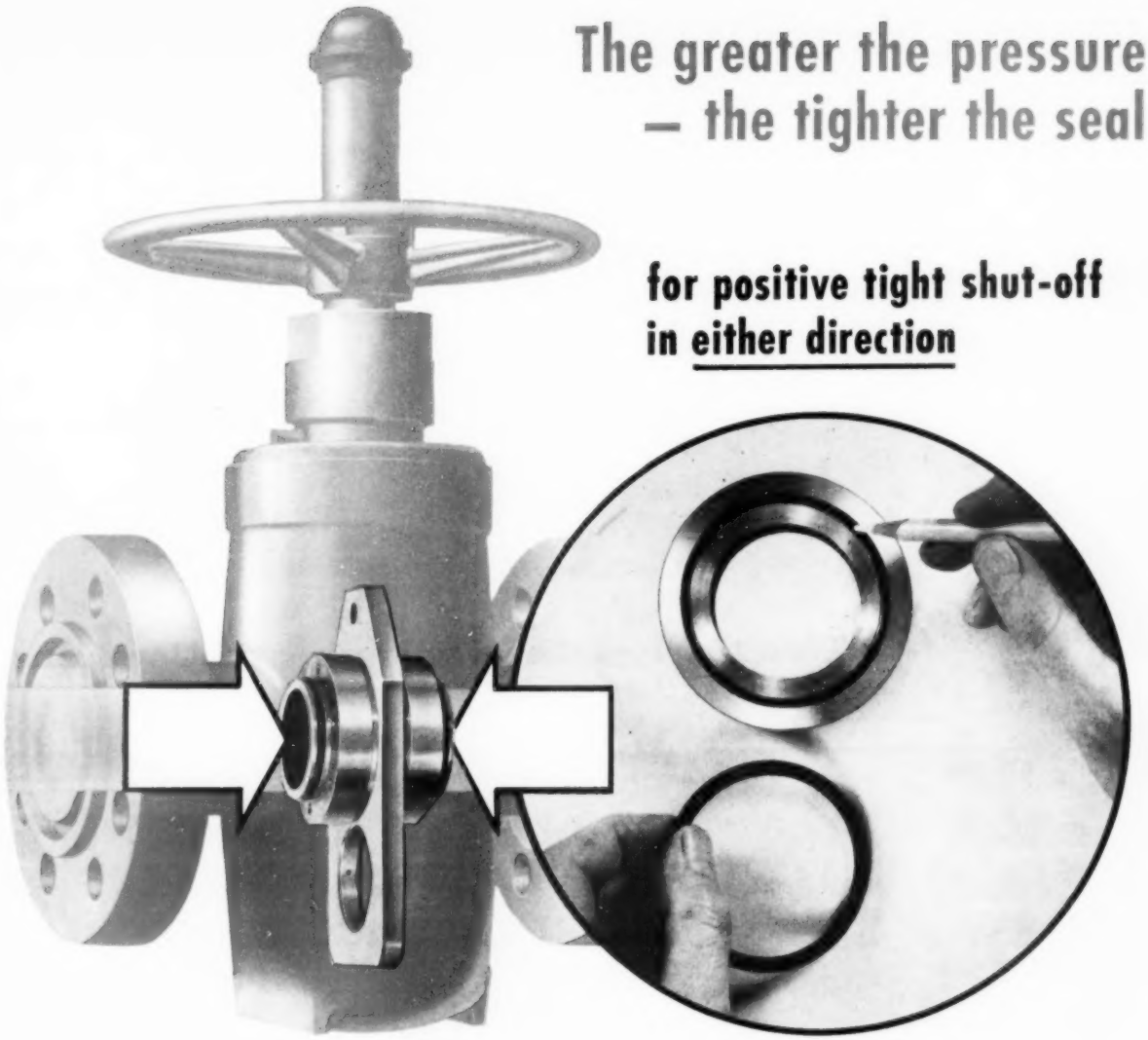
for positive tight shut-off in either direction



Line pressure exerts the force which holds the seat ring assemblies and the solid parallel-faced port plate tightly together. This effects positive tight metal-to-metal sealing contact with no wedging or distortion of seating surfaces. This precision seal is backed up by the dual sealing action of the resilient "O" ring for absolute, bubble-tight shut-off. Thus, the greater the pressure, the tighter the seal. Seating surfaces are wiped clean with each operation of the valve. For long life, trouble-free service with low maintenance, investigate Grove SEAL-"O"-RING Valves today.

For fully descriptive bulletin No. G-53, write or wire today

Available through leading oil field supply houses

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Proven by 100,000,000 miles in medium heavy-duty trucks...

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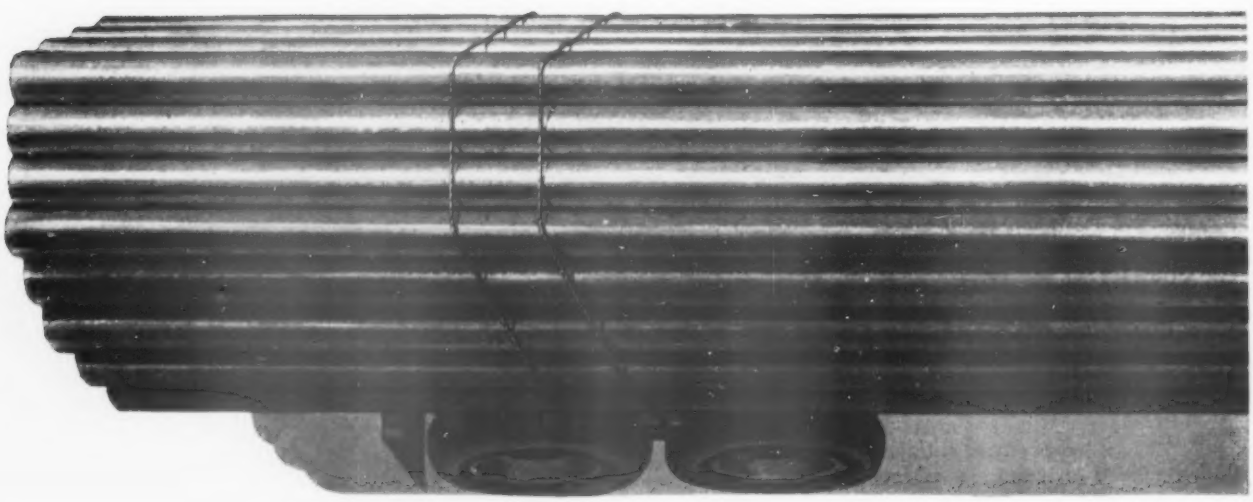

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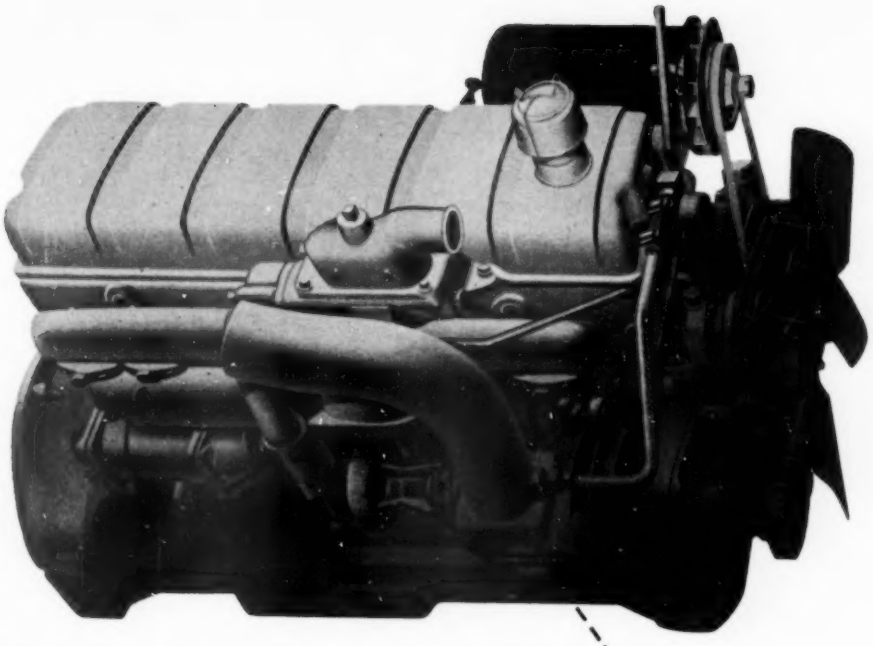
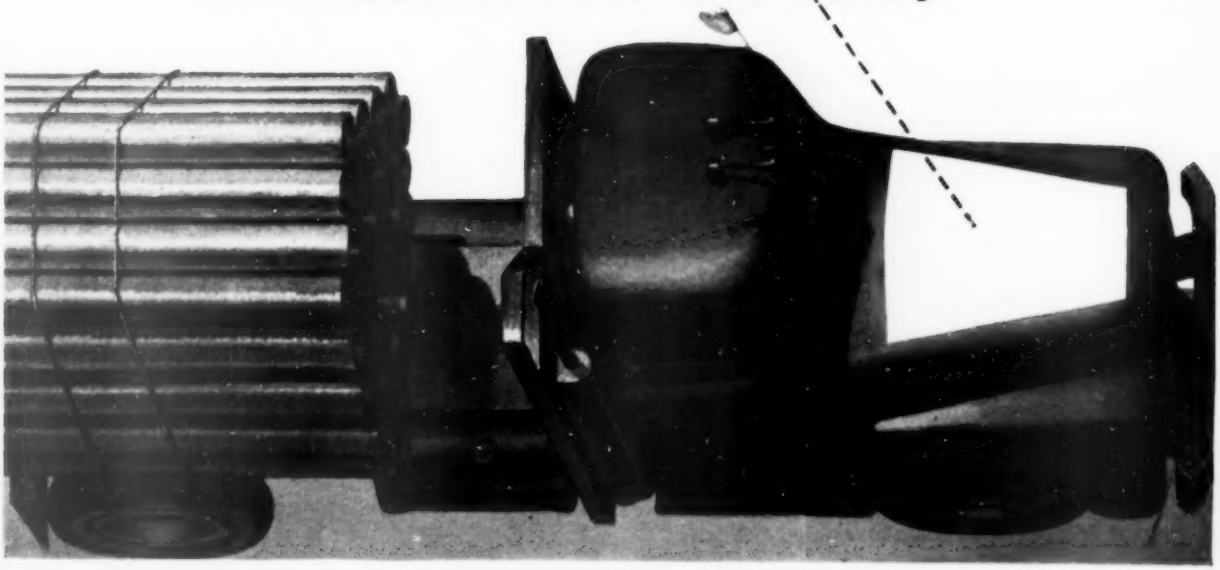


outstanding performance and economy



Under all kinds of operating conditions, the new Model JBS-600 has proved it can meet the needs of medium heavy-duty truck operators. It has the same features which have long made Cummins engines the standard of diesel quality—features formerly available only in heavy-duty trucks:

- 4-cycle design for ruggedness and long life.
- Exclusive Cummins fuel system for simplicity and economy.
- Operation on inexpensive No. 2 diesel fuel for minimum fuel costs.

Cummins JBS diesel power is offered by the following *leading* truck manufacturers: Autocar, Corbitt, Diamond T, Federal, Hendrickson, International Harvester, Kenworth, Reo and White.

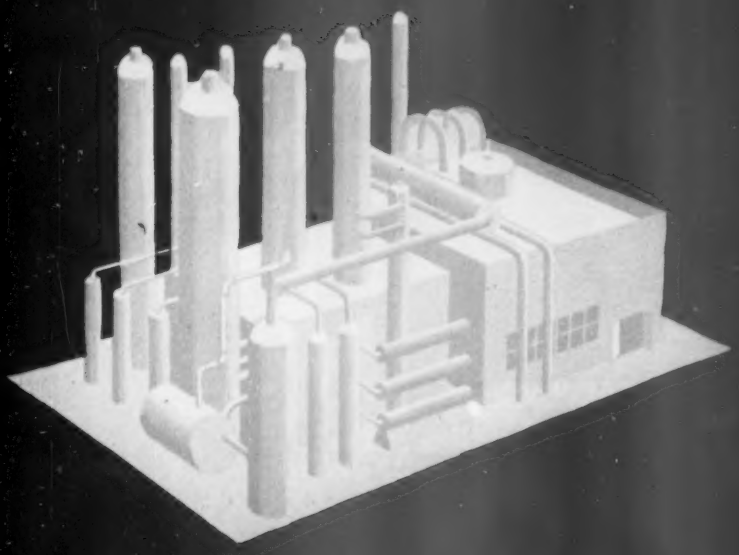
See your Cummins dealer or representative of one of the manufacturers listed above.

Cummins®

Engine Company, Inc. • Columbus, Indiana

Leaders in rugged, lightweight, high-speed diesel power [60-600 h.p.]

AUTOMATION...



will prevent processing headaches

The increasing complexity of petrochemical processing will call for automation beyond today's approach to measurement and control.

Continuous analyzers, for example, point to a significant trend toward "thinking machines," which may ultimately control a whole process on the basis of desired qualities in the finished product. Honeywell has helped to implement this and other new concepts, and will continue to work toward the realization of practical automation.

While the capabilities of instrumentation are being extended, so too is its dependability. For the more automatic a plant gets, the greater becomes the responsibility on the automatic equipment which keeps processes coordinated.

Long identified with instrumentation's parade of progress, Honeywell's Industrial Division serves the petrochemical industry from lab to pilot plant to "on-stream" operation. MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA:** Write for your copy of "How Automatic Can We Get?" a challenging discussion of the future of instrumentation.

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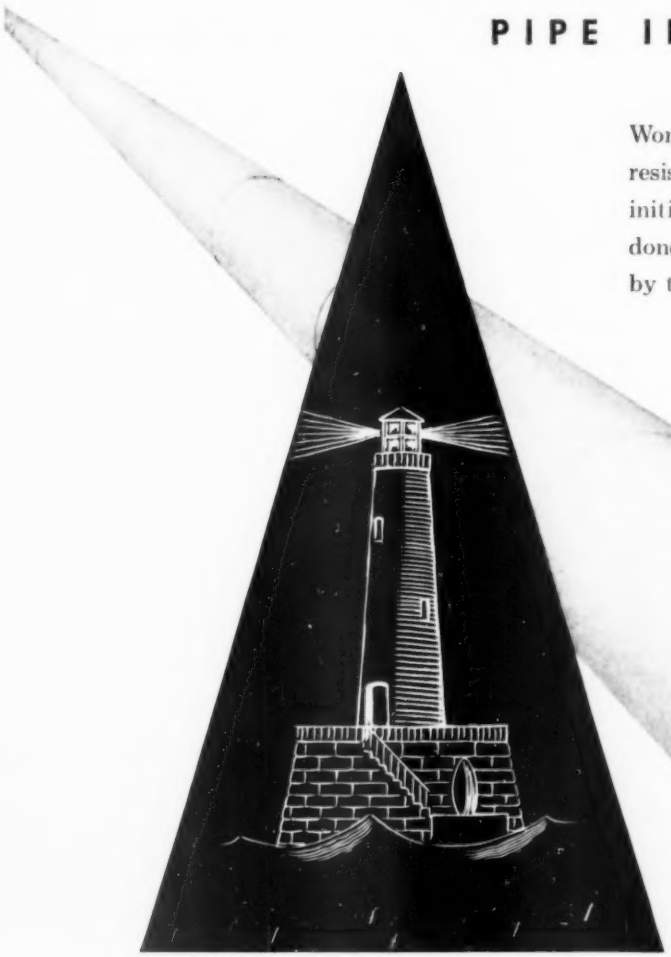

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● **Our wide experience** in providing quality finishes for the petroleum industry may be helpful to you—and save you time and money. Call on us for free advisory service.

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● Pittsburgh has a comprehensive ready-reference manual which contains complete information on all finishes for the petroleum industry. Included are suggestions for proper application and maintenance. We'll be glad to send you a copy without cost or obligation. Just fill out and mail coupon below, with one of your company's letterheads.

Pittsburgh Plate Glass Company
632 Fort Duquesne Blvd.
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Please mail me copy of your handy reference manual, "Pittsburgh Paints for the Petroleum Industry."

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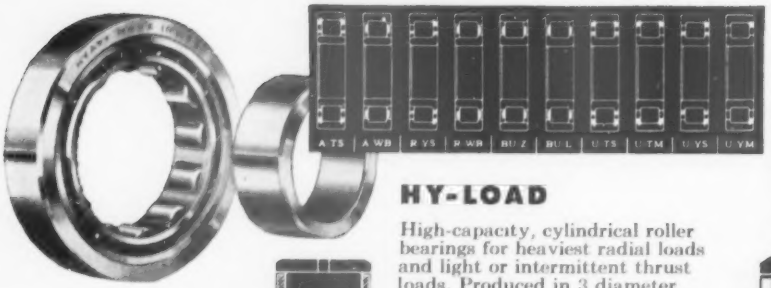
PITTSBURGH PLATE GLASS CO., Industrial Paint Div., Pittsburgh, Pa. Factories: Milwaukee, Wis.; Newark, N. J.; Springdale, Pa.; Atlanta, Ga.; Houston, Texas; Los Angeles, Calif.; Portland, Ore. Ditzler Color Div., Detroit, Mich. The Thresher Paint & Varnish Co., Dayton, Ohio. Forbes Finishes Div., Cleveland, Ohio. M. B. Suydam Div., Pittsburgh, Pa.

PITTSBURGH PAINTS

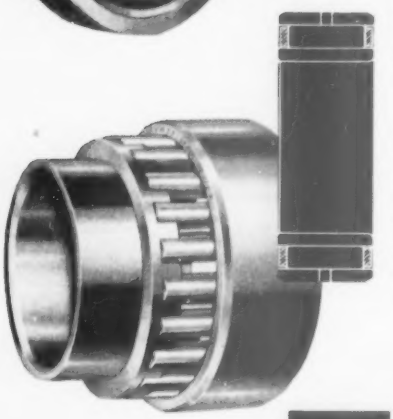
PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY



HY-LOAD

High-capacity, cylindrical roller bearings for heaviest radial loads and light or intermittent thrust loads. Produced in 3 diameter series, 2 widths and more than 800 sizes.



INDUSTRIAL INCH

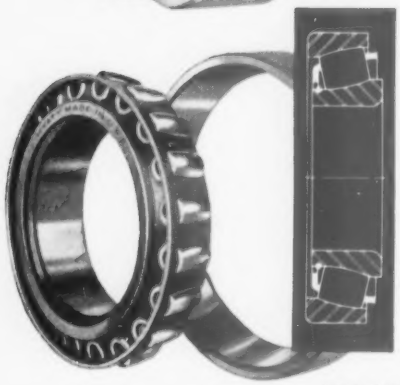
Designed for slow-moving, heavily loaded machinery where large-diameter shafts are the rule. Accordingly, it is available in fractional-size bores for shafts from 4″ in diameter upwards.

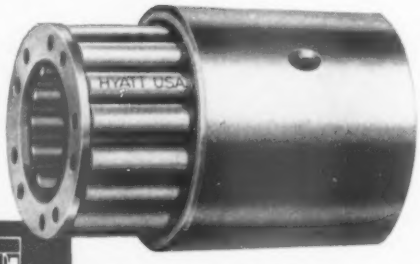
WOUND ROLLER

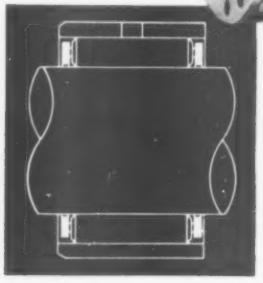
This is a three-part separable bearing available in various width classifications. The roller construction provides maximum resistance to shock, abrasion and fatigue.

BARREL

A series of angular-contact, self-aligning bearings capable of sustaining both radial and thrust loads. Race and roller curvatures insure ideal distribution of load, not only for normal operation but also for conditions of misalignment.







TRUNNIONED ROLLER

Ideal for industrial trucks, textile machinery, gear pumps, conveyors, hoists and agricultural equipment. Rollers have trunnioned ends which fit into holes in the end rings. End rings are located and held parallel by spacing bars which also guide and retain rollers.

DESIGNED FOR HEAVY DUTY...

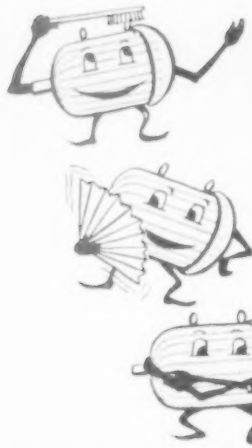
HYATT ROLLER BEARINGS

...and there's a type and size for every need

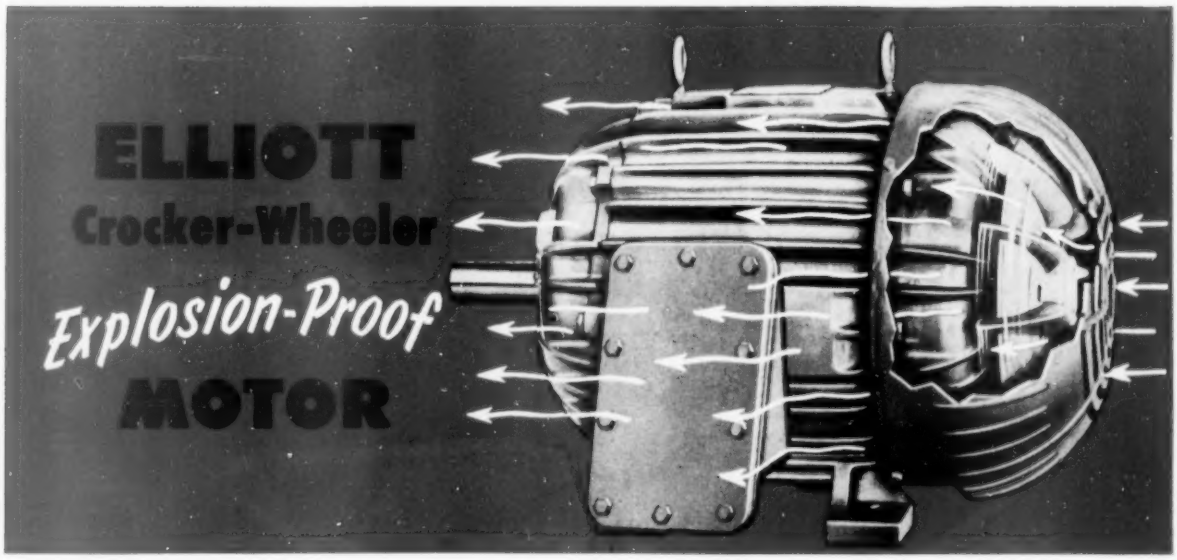
Hyatt's complete line of radial and angular-contact bearings—*more than 800 sizes in the Hy-Load series alone*—makes the engineers' job easier, because it makes possible greater design flexibility. For the equipment *buyer*, this means longer bearing life and lower maintenance costs—with just the right bearings designed into every vital load-carrying position.

The next time you buy new equipment, or make a changeover, *specify lower maintenance costs by specifying Hyatt Bearings!* And if you need technical help in your selection of bearings, or desire information about particular bearings or their applications, ask for the services of a Hyatt sales-engineer. Call or write Hyatt Bearings Division, General Motors Corp., Harrison, N. J.

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION

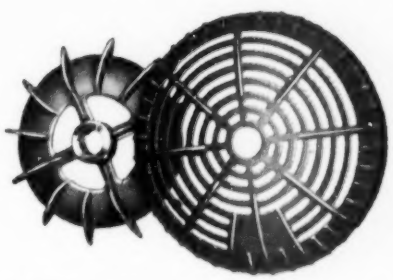


It's self-cleaning!
It's self-cooling!
It's explosion-proof!



Here's a totally-enclosed motor that acts as its own heat exchanger, driving a directed blast of air around the *outside* of the motor along the full length of the heat-radiating fins. This air blast not only sweeps off heat as fast as it is developed, but also prevents the settling of dust or other material on the motor, building up an additional barrier to the release of heat.

Now available with explosion-proof enclosure, underwriters approved, the Elliott Crocker-Wheeler Sealedpower is an ideal motor for hazardous locations, indoors or out. Refineries, natural gasoline plants, pipe lines, chemical plants, flour mills — everywhere in fact where totally-enclosed motors with explosion-proof qualities are a must — are using rugged Elliott C-W Sealedpower motors with full satisfaction. In NEMA frames, ratings to 100 hp. For full data, contact your nearest Elliott district office or write Elliott Company, Jeannette, Pa.

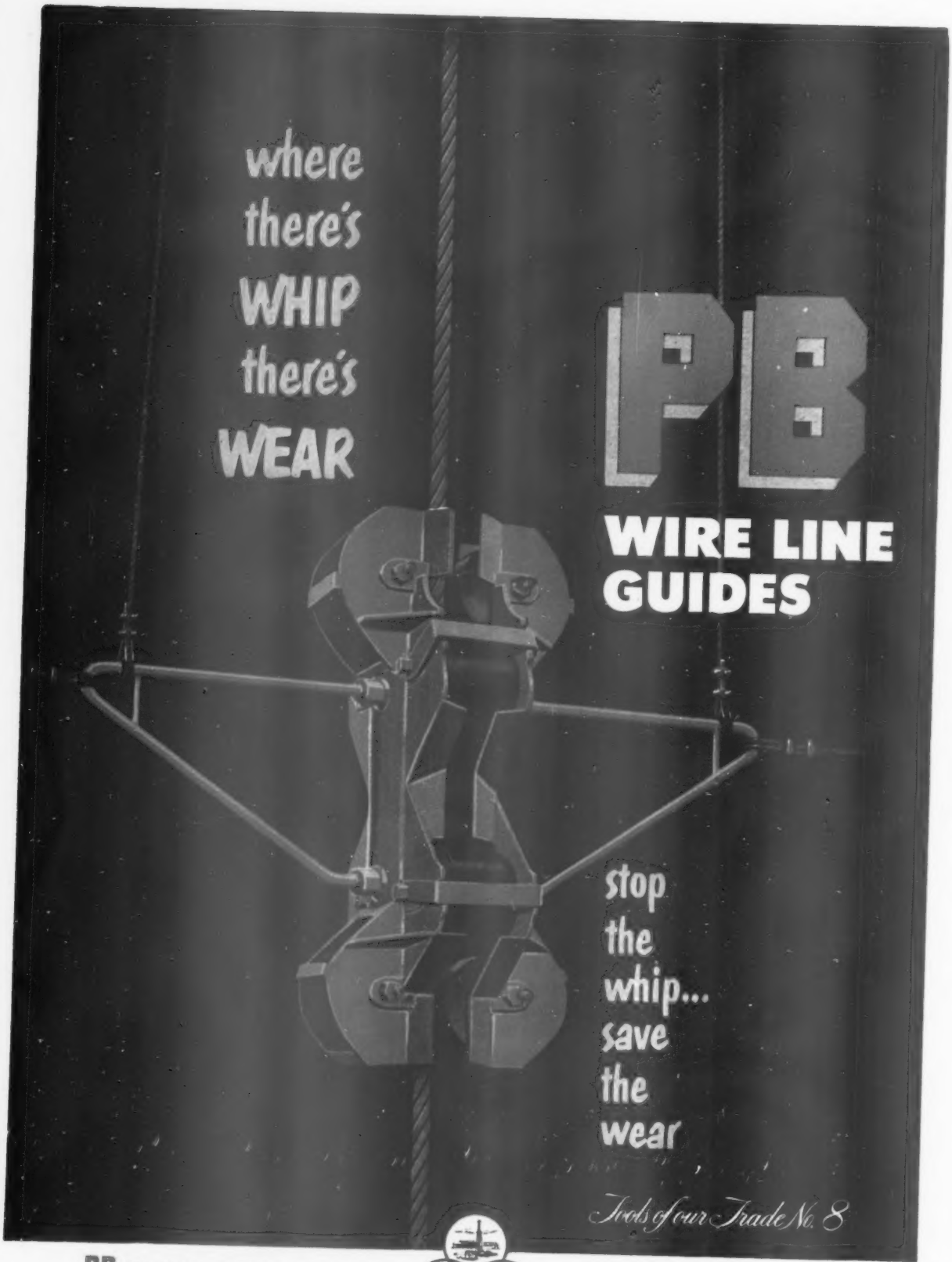


THE FAN AND COWL. *Fan is one-piece, non-sparking bronze. The cowl is of gray cast iron, so designed as to direct the flow of cooling air along the outside surface of the frame.*

ELLIOTT Company

CROCKER-WHEELER DIVISION

W3-9

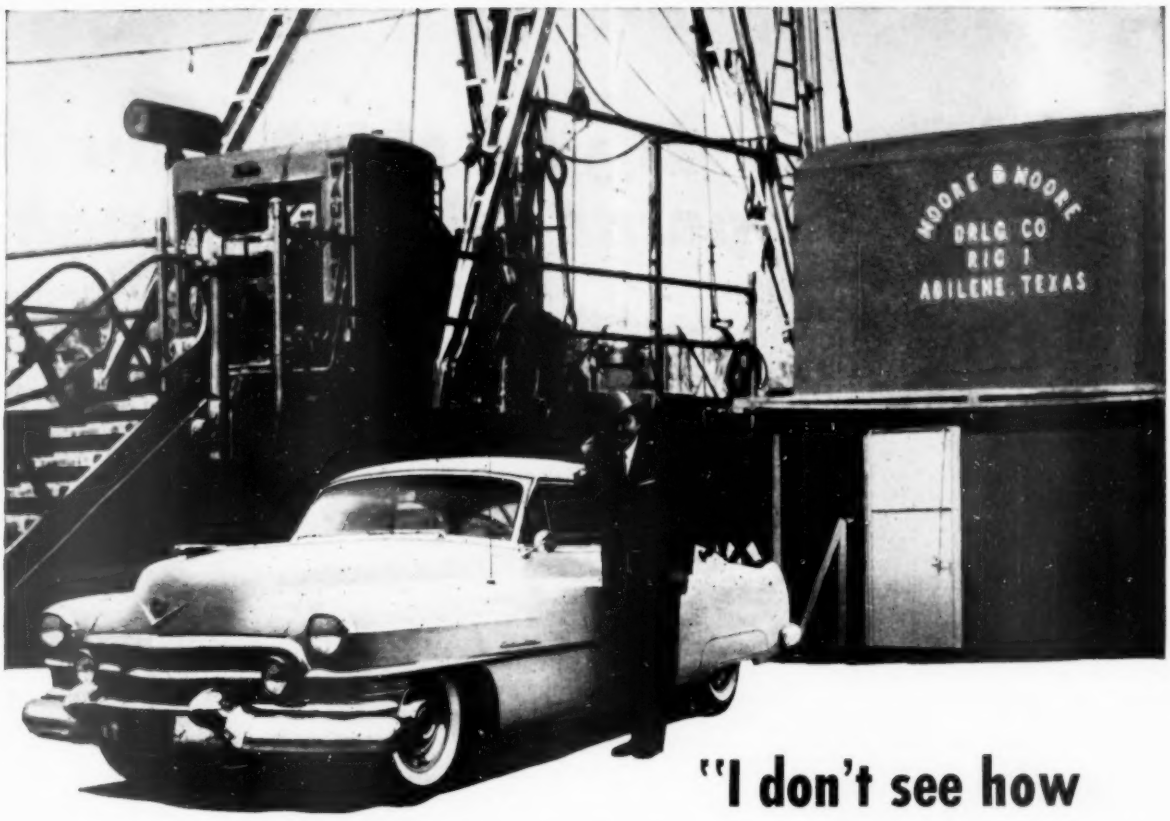


PB OIL FIELD RUBBER SPECIALTIES

BJ PB

Byron Jackson Co. Since 1872

LOS ANGELES NEW YORK FORT WORTH HOUSTON



"I don't see how we ever did business without RCA 2-Way Radio"

—says L. H. MOORE of Moutray-Moore Drilling Co., Inc. and Moore & Moore Drilling Co.

"AS A CONTROL MECHANISM, our RCA Fleetfone equipment in my home, the home of our drilling superintendent shop, office, 6 rigs and 10 cars, keeps us informed as to the activities in West Central Texas for which we are responsible and assures us that our plans and policies are being carried out according to schedule," says Lamar H. Moore.

"Oilfield equipment has to be tough to stand up to the treatment it must receive, so, when we bought 2-way radio we selected RCA as the radio best suited to our requirements," says Mr. Moore.

"For all-round coverage, for operation under tough field conditions, we chose RCA Fleetfone Radio. And it has measured up in every way. Rough roads and back country give equipment a gruelling workout every day in the week. RCA 2-way radio is the one that proved it can take it."

RCA 2-Way Radio increases efficiency

"RCA 2-Way Radio has increased our efficiency in drilling operations," concludes Mr. Moore. "Efficiency in service rendered to the operator is a must to a drilling contractor. Two-way radio has enabled us, by giving direct contact with the rigs, to obtain a peak of efficiency which we never dreamed possible."

In everyday routine contacts . . . in emergencies . . . RCA 2-way radio can help make your job easier—can help you cut your costs. Investigate RCA 2-way radio. MAIL COUPON.

RADIO CORPORATION of AMERICA
COMMUNICATIONS EQUIPMENT — CAMDEN, N. J.

RCA Engineering Products
Communications Equipment
Dept. 89X, Building 15-1
Camden, New Jersey

Please send me your free booklet
RCA *2-Way Radio* for *Industry*.

Name_____ Title_____

Company_____ Address_____

City_____ Zone_____ State_____

Please have an RCA representative call on me.

If you think your paint jobs are tough

If you place the orders or approve the bills for jobs like this, you know how painting costs break down. And you know that the cost of even the best paint is only a small part of the total—nowhere near what it saves by adding extra years between repainting. That's why so much quality aluminum paint is used for jobs like this.

Because aluminum paint is the first choice for many industrial applications, special formulas have been developed. Paints made to these formulas last longer, cover better, stand up under corrosive industrial smoke and fumes.

If you have plants, structures or equipment that need paint, it will pay you to find out more about the kinds of aluminum paints now available. We do not make paint. But, as the leading suppliers of aluminum pigments to paint manufacturers, we want you to get the best results from the aluminum paint you buy.

Write us about your paint problems and we'll recommend the kind of paint to use. We'll also send you a copy of *Painting with Aluminum*. It is packed with facts and answers to all types of industrial painting questions. Write Paint Service Bureau, Aluminum Company of America, 1791-M Alcoa Building, Pittsburgh 19, Pennsylvania.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA

Alcoa brings the world to your armchair with "SEE IT NOW" featuring Edward R. Murrow. Tuesday evenings on most CBS-TV stations.

steel-stretcher

CUTS COMPLETION COSTS, TOO . . .

HALLIBURTON'S DV

MULTIPLE STAGE CEMENTER

Whittling down completion costs is more than wishful thinking when you use this versatile tool. Frequently, it means eliminating a string of production casing by cementing above a certain level in the field. And it permits three stage cementing without removal from the hole, thus reducing completion costs.

Halliburton's Multiple Stage Cementer – utilizing an exclusive Differential Valve principle – provides additional proved advantages: full depth cementing, reducing channeling, limiting pump pressures, cementing off formations at any point, and preventing slurry loss.

Two telescoping sleeves provide a key to its outstanding performance. The lower, or opening, sleeve seals tool ports during passage of cement for the lowest job. An upper sleeve seals tool ports after completion of the next stage. A special arrangement of opening and closing plugs and tool sleeves affords effective three stage cementing.

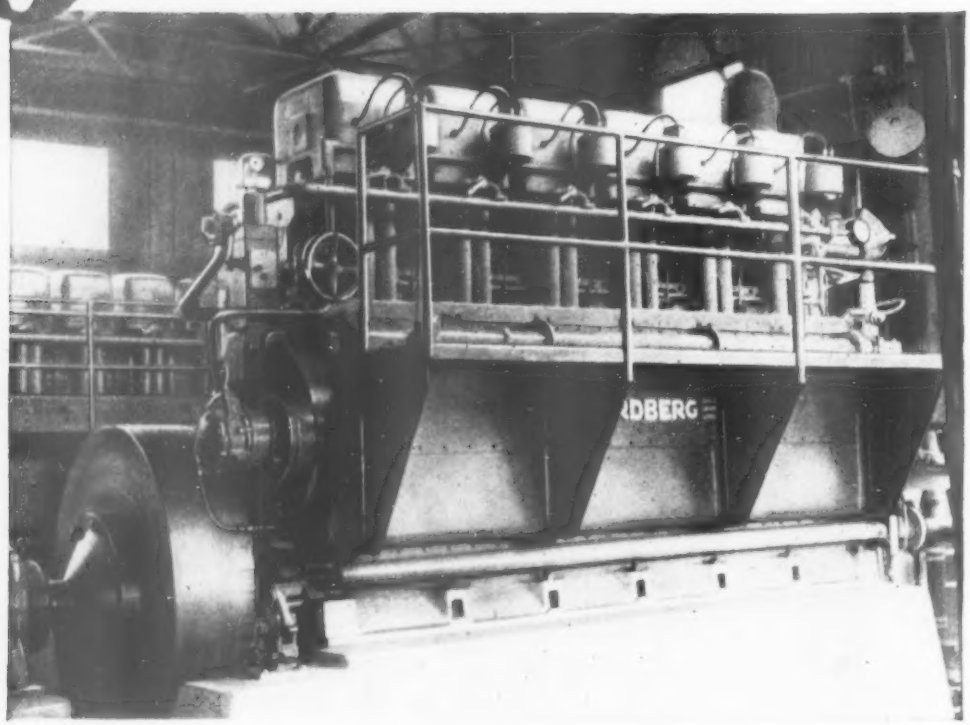
This remarkable tool continues to gain favor with operators because it stretches steel . . . and cuts completion costs, too. Use it on your next job. Call your nearby Halliburton representative. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

YEARS AHEAD IN ADVANCED CEMENTING TECHNIQUES!

10 NORDBERG SUPAIRTHERMAL* SPARK-IGNITION GAS ENGINES

ON CRUDE OIL TRUNK LINE



PHILLIPS PIPE LINE COMPANY recently installed ten new Nordberg four-cycle *SUPAIRTHERMAL* Spark-Ignition gas engines for crude oil trunk line pumping service.

These highly efficient 13" x 16½" Nordberg six-cylinder gas engines are rated 935 hp at 475 rpm at altitude, and embody the exclusive Nordberg variable inlet valve timing control. This precise timing gives the correct air-fuel mixture from half to full load, assuring uniform combustion and smooth economical operation. The *SUPAIRTHERMAL* principle increases the engine's load-carrying ability at any given speed over a wide speed range. This reserve power is like "money in the bank" when additional power is needed.

For full details on Nordberg *SUPAIRTHERMAL* engines, in sizes from 535 to 4260 hp, write for Bulletin 191.

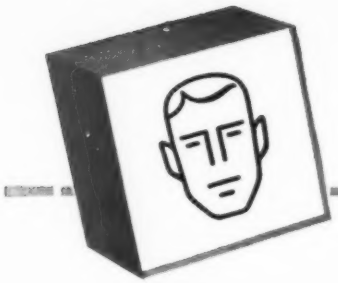
*Trade Mark

NORDBERG MFG. CO., Milwaukee, Wisconsin

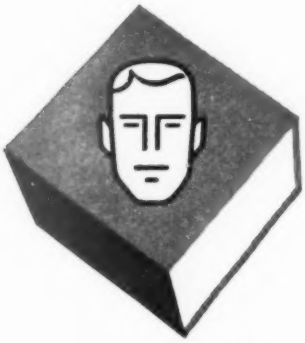
NORDBERG

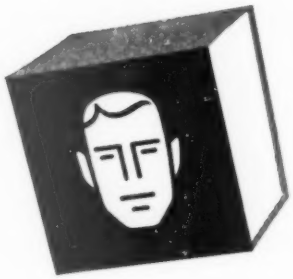
DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

0353



Are you getting the most out of YOUR ALLOY STEELS?





REPUBLIC 3-DIMENSION METALLURGICAL SERVICE

can help you answer this Question

You may be getting all the qualities you expect from the alloy steels you use. But you may not be taking advantage of some important properties which could make your products even better. Or cheaper to produce.

The best way to find out is to call in Republic's Three-Dimension Metallurgical Service. Here's how it works. First, Republic Field Metallurgist looks over your products and your plant. His report goes to the Republic Mill and Lab Metallurgists. All three then pool their knowledge of alloy steels, heat-treatment, and fabrication.

The results: recommendations that often mean better products, higher production and lower costs. And there are scores of Republic customers who have had this pleasant experience.

Whether your product is well established . . . or you're planning a new one . . . it will profit you to take advantage of this complete and extensive consulting service for steel users. It's available through your local Republic Steel Sales Office.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

LAB FIELD MILL
3-DIMENSION Metallurgical Service

...combines the extensive experience and coordinated abilities of Republic's *Field*, *Mill* and *Laboratory* Metallurgists with the knowledge and skills of your own engineers. It has helped guide users of Alloy Steels in countless industries to the correct steel and its most efficient usage. IT CAN DO THE SAME FOR YOU.

REPUBLIC STEEL
Republic ALLOY STEELS

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

ESCO High Alloy Castings
RESIST CORROSION
ALL THE WAY THROUGH!

Preparing centrifuge rotor castings for ZYGLO black light examination.

X-Ray inspection makes sure ESCO Castings for corrosion service are free of internal or hidden flaws.

Advanced gamma ray inspection, using Cobalt 60 Capsule and photographic plates.

ESCO ADVANCED NON-DESTRUCTIVE INSPECTION ASSURES UNIFORMLY SOUND CASTINGS

A Wide Range of ESCO High Alloy Products available for critical conditions of Heat and Corrosion.

- Pipe and Flanges
- Heavy-duty Valves
- Standard and Special Flanged Fittings
- Welded Fittings
- Screwed Fittings
- Kiln Cooler and Roaster Parts
- Refinery Castings
- Heat-Treating Parts
- Conveyor Chains

Of utmost importance in extreme corrosion service are castings that are sound *all the way through!* To make certain you receive only the highest quality alloy castings that can be produced, *ESCO* employs closely controlled scientific techniques for non-destructive inspection and testing. This is only one of the many reasons why an *ESCO* high alloy casting in your worst corrosion trouble spot will outlast others *many times over!*

ESCO metallurgical engineers work with more than 40 different high alloy steels every day... making pioneering contributions to the art of producing castings of unsurpassed corrosion resistance.

ESCO will be glad to recommend the *right* high alloy casting to combat *your* particular corrosion trouble. Whether you need one casting or an entire installation, your inquiry will receive prompt attention.

ESCO

Offices and Warehouses: Honolulu, Hawaii; Houston, Texas; New York, New York; Los Angeles, San Francisco, California; Seattle, Spokane, Washington; Centralia, Pennsylvania; Eugene, Medford, Oregon; Salt Lake City, Utah. In Canada: Vancouver, B. C., and Toronto, Ontario.

ELECTRIC STEEL FOUNDRY CO.

2181 N.W. 25TH AVE., PORTLAND 10, ORE. 712 PORTER ST., DANVILLE, ILL.

They Say—

Industry Needs More Expansion

"... Proven oil and gas reserves held in the ground and available for immediate use in case of emergency are highly essential, but enormous oil reserves are almost useless unless they can be matched by similar reserves of transportation and refining capacity to meet accelerated military and civilian demands.

"Adoption of a workable incentive program for all essential industries would not only forge a stronger national defense program, but would add vigor to the nation's economy through increased construction and employment."

D. W. Hovey, president of Danaho Refining Co., in a statement to the press.

Foreign Operators Have Two Fights

"It is easy enough for a government official to sit on a well-padded cushion in Washington and criticize some of the foreign operations of American oil companies as 'cartel-like.'

"It is equally easy for one administration after another to make political capital out of attacking these 'big' companies—even at the risk of undermining, thereby, the security of our military-vital foreign oil reserves.

"But how difficult it is for these American oil companies to steer some kind of sane course between the varying antics of the United States political scene, on the one hand, and the multitudinous laws and customs of the 60 or more foreign countries in which they operate, is not widely realized.

"Despite these difficulties, the large investments of American oil companies abroad constitute a private Point 4 program far more successful than any amount of direct government aid."

W. M. Jablonski, writing in the New York Journal of Commerce.

Oil Prices Must Keep Going Up

"No one in industry or government ... can say what the ideal price for oil should be. It is not a manmade price. In the present situation, where discoveries are not ample, the ideal price can be determined only by the trial and error method of raising and again raising the posted price until drilling is stimulated to the point where continuity of supply is assured.

"Sooner or later the market price

FOR A QUARTER-CENTURY—Baroid has continually assisted drilling industry progress by developing, producing and distributing the most *complete line* of quality mud products. They're available in every active United States oil area and backed by Baroid's research and service reputation.

Distribution of Baroid's complete line of mud-making and mud-treating materials — high yield colloidal clays, organic colloids, weight material, chemical treating agents, lost circulation materials and mud emulsifiers . . . proven products for every drilling problem—has kept constant pace with drilling demands.

Authorized Baroid distributors can supply your immediate mud product needs by the sackful, truckful or carload, from almost 600 distribution points. Strategically located for quick service in your area, Baroid distributors can deliver these high quality mud products within minutes of your call.

Your assurance of dependability . . . past, present, and future . . . is the Baroid distributor sign.

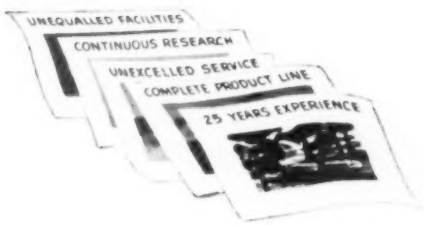
3960

NOW AS EVER

you can rely on

Baroid's

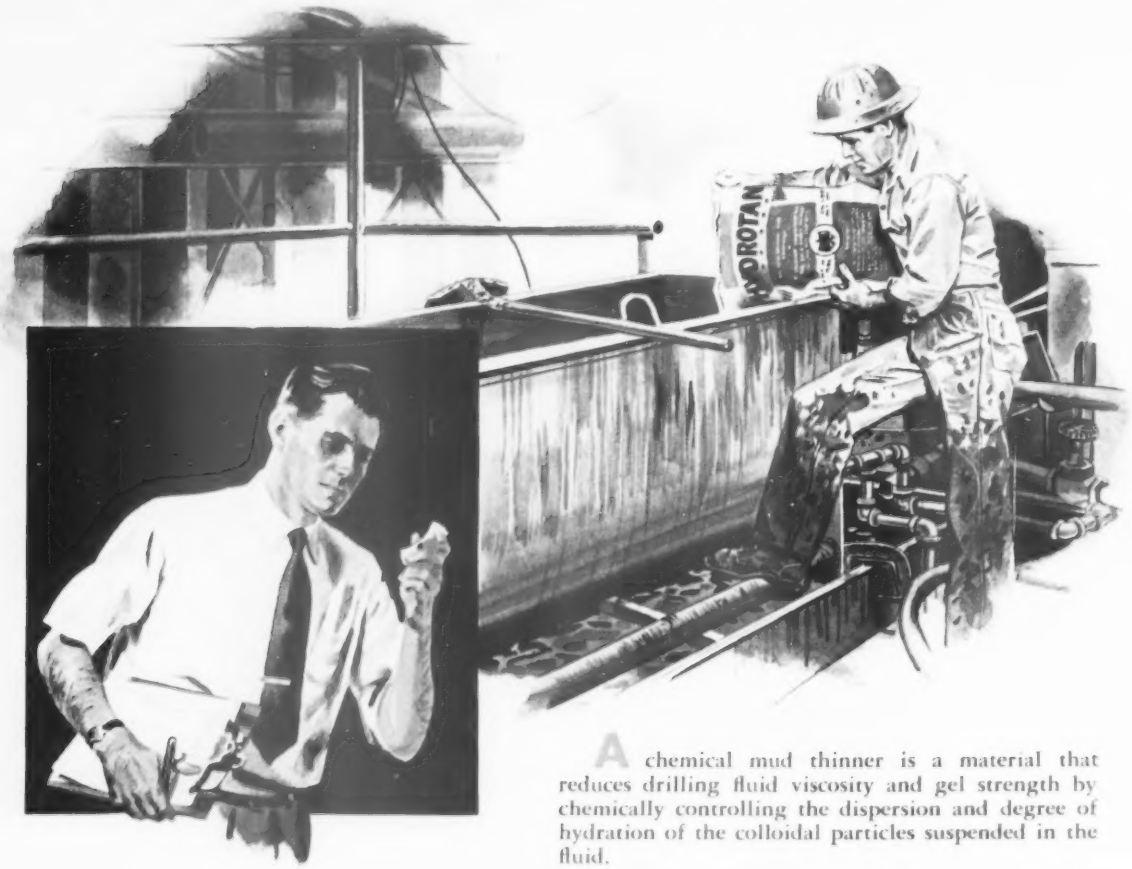
Complete product line



: for faster, more efficient drilling!

Baroid Sales Division — National Lead Company • Houston • Tulsa • Los Angeles ☆ Main Office: P. O. Box 1675, Houston 1, Texas

HYDROTAN and HYDROCARB



3 YEARS

of successful mud control experience with Baroid's

ALKALINE-ORGANIC THINNERS

A chemical mud thinner is a material that reduces drilling fluid viscosity and gel strength by chemically controlling the dispersion and degree of hydration of the colloidal particles suspended in the fluid.

The organic thinners are usually compounded with alkaline chemicals to increase their efficiency, speed their solubility and, through the amount of alkalies added, give pH control of the mud.

Baroid's HYDROTAN and HYDROCARB are the original successful pre-mixed alkaline-organic mud thinners. HYDROTAN, an alkaline-tannate, and HYDROCARB, an alkaline-Carbonox, are compounded as liquids, then dried and packaged in handy 50-pound bags.

The ratios of alkali to organic in these compounds, determined by years of field experience, allows the most effective mud control over the widest range of drilling conditions.

The successful widespread field use, since 1950, of Baroid's HYDROTAN and HYDROCARB has contributed to more efficient and economical drilling fluid control.

HYDROTAN and HYDROCARB are available from your mud product supplier.

NOW AS EVER...

you can rely on

Baroid

BAROID SALES DIVISION • NATIONAL LEAD COMPANY

MAIN OFFICE: P.O. BOX 1675, HOUSTON 1, TEXAS

BAROID P. O. Box 1675, Houston 1, Texas

Please send me full information about Baroid's alkaline-organic thinners.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

must approximate the ideal price. When artificial influences of any nature prevent the market price from following the ideal price upward, only for a while will there be production. Shortly, production withers. Thereafter, the problem is no over production, or even ample production, but rather rationing of available production."

R. F. Windfohr, president of the Texas Mid-Continent Oil and Gas Association, addressing the annual meet- of the association, Fort Worth.

Retained Funds Going Into Use

"We see . . . that the capital requirements of the industry have vastly expanded in the postwar period and that the role of retained earnings, or the 'plough-back' as we call it, has substantially enlarged. The remainder of the capital requirements in both periods was financed out of book charges for depletion and depreciation, together with some contributions from the capital markets.

"While aggregate capital expenditures cannot be precisely segregated into those used for replacement and those used for growth, we know that our depletion and depreciation accounts are not sufficient to cover 'exhaustion of plant and properties' in the presence of rising costs. Therefore, part of the retained earnings must go toward making up the difference. Accordingly, the idea takes shape that depreciation charges and a part of retained earnings underwrite the replacement and enlargement of the physical plant while depletion funds and another portion of retained earnings must go toward replacing and increasing the oil reserves."

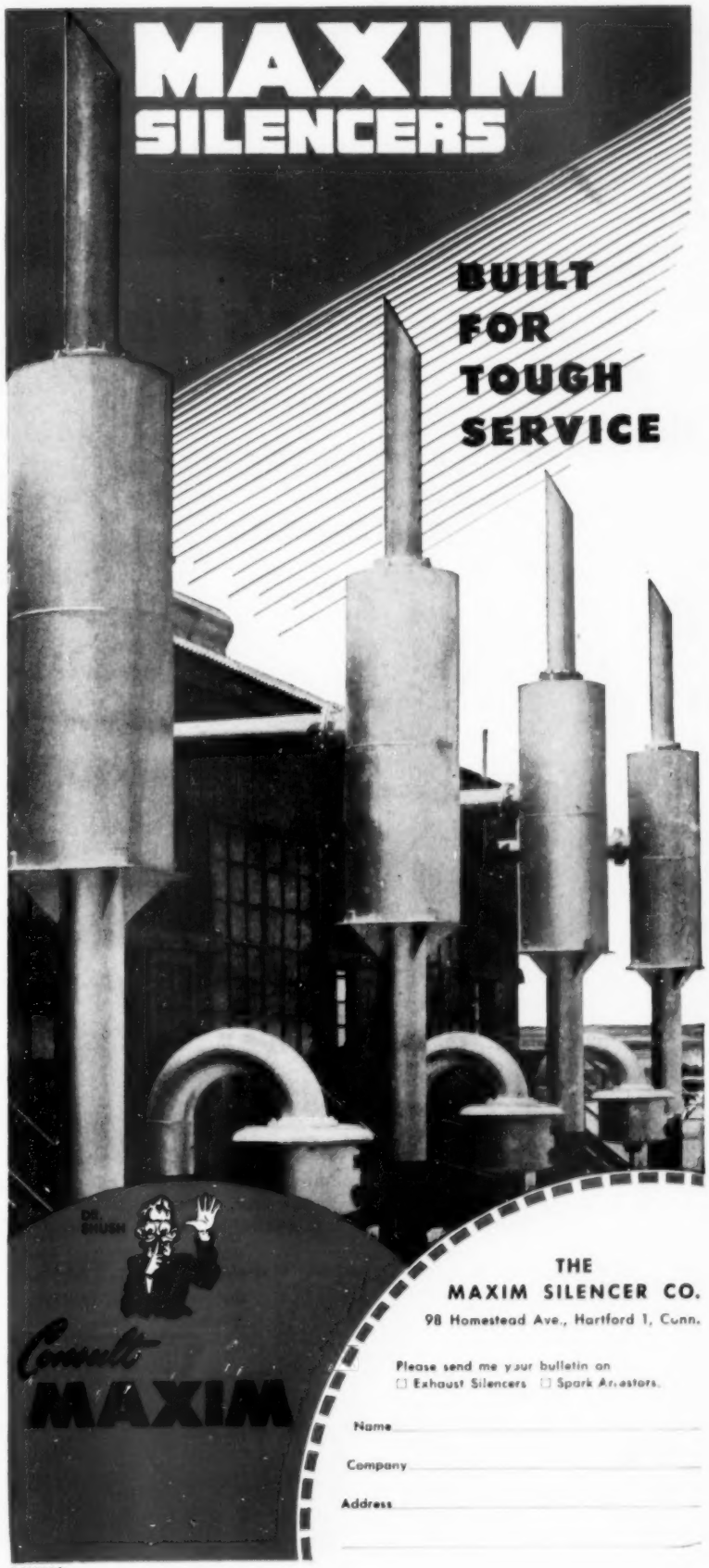
S. A. Swensrud, chairman of Gulf Oil Corp., addressing the annual meeting of the New Mexico Oil & Gas Association, Albuquerque.

Gas Makes Smog Problem Simple

"As winter nears the problem of air pollution on days when atmospheric conditions are unfavorable will be with us again.

"Any control program is bothersome but, by comparison, Kansas City's is relatively simple. Cities without gas as both a home and industrial fuel have a gigantic control task. We are fortunate here.

"Since Kansas City is lucky, with science helping the Southwest to develop natural-gas reserves far larger than was estimated a few years ago,



WECO

DROP-SIDE
SNATCH BLOCKS

Your Best Buy
and Here's Why..

These 7 great features assure superior service and performance. WECO Drop-Side Snatch Blocks are easy to handle . . . safer to use . . . have greater strength, safety and utility.

Sides are 3/8" steel plate. Hook or clevis is full swiveling. Wire line or manila rope cannot slip between sheave and side plates.

The patented WECO Drop-Side makes it easy to string or unstring the snatch block at any time. You just remove the wing-nut, raise the side, insert the line, drop the side and replace the wing-nut. Blocks are available in 6", 8" and 10" sizes.

Ask your Supply Store or industrial distributor for WECO Drop-Side Snatch Blocks.

It's Wise to Standardize with... WECO ...

WELL EQUIPMENT MFG. CORP.
Division of Chiksan Company
HOUSTON 1, TEXAS
CHIKSAN COMPANY
Brea, Calif. Chicago 28, Ill. Newark 2, N. J.
CHIKSAN EXPORT COMPANY, Brea, Calif. Newark 2, N. J.

Manufacturers and Distributors of Oilfield, Refining, Marine and Industrial Equipment

there is all the more reason why pollution from a few smoke-belching chimneys should be avoided."

Editorial from The Kansas City Star.

CALENDAR OF EVENTS

DECEMBER

13-16 American Institute of Chemical Engineers, annual meeting, Hotel Jefferson, St. Louis.

1954

JANUARY

11-15 Society of Automotive Engineers, annual meeting and engineering display, Sheraton-Cadillac and Statler Hotels, Detroit.

12-14 National Constructors Association, annual meeting, Hotel Commodore, New York City.

18-20 Pipe Line Contractors Association, sixth annual convention, Shamrock Hotel, Houston.

18-22 American Institute of Electrical Engineers, winter general meeting, Hotel Statler and Hotel McAlpin.

25-28 Plant Maintenance & Engineering Conference, Hotel Conrad Hilton, Chicago.

27-29 Ninth annual symposium, "Instrumentation for the Process Industries," Texas A. & M. College, College Station, Tex.

25-28 Plant Maintenance & Engineering Show, International Amphitheatre, Chicago.

FEBRUARY

1-5 National Association of Corrosion Engineers, annual short course in corrosion, Washington State College, Pullman, Wash.

4 Instrument Society of America, ninth annual regional conference, Hotel Statler, New York City.

11-12 Western Petroleum Refiners Association, regional meeting, Hotel Beaumont, Beaumont, Tex.

22 American Association of Petroleum Geologists, Rocky Mountain section, annual meeting, Albuquerque, N. M.

26 Natural Gasoline Association of America, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

MARCH

1- 5 American Society for Testing Materials, spring meeting, Shoreham Hotel, Washington, D. C.

3- 5 American Petroleum Institute, Division of Production, Southwestern district, Rice Hotel, Houston.

4- 5 American Gas Association, transmission and storage conference, Jung Hotel, New Orleans.

8-10 American Institute of Chemical Engineers, Statler Hotel, Washington.

15-19 National Association of Corrosion Engineers, annual meeting, Municipal Auditorium, Kansas City, Mo.

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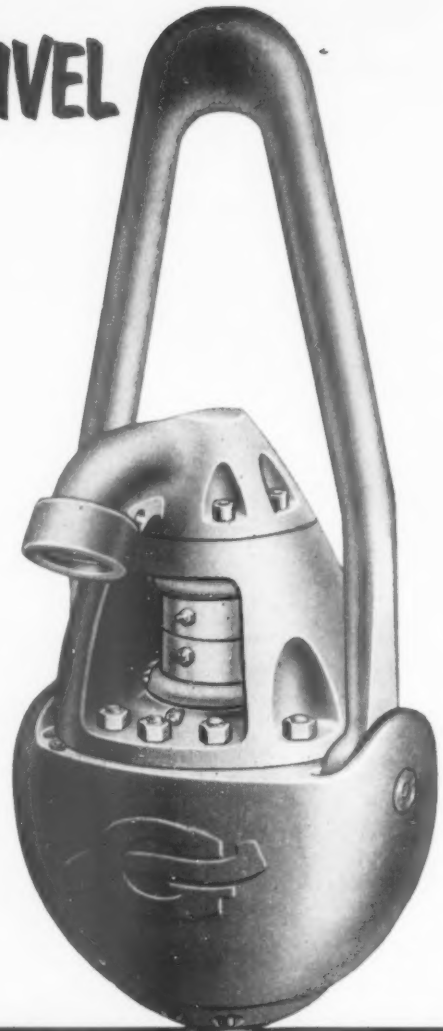

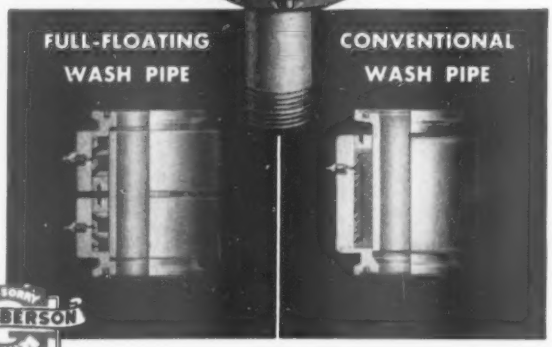

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17-19 American Petroleum Institute, Division of Production, Mid-Continent district, Biltmore Hotel, Oklahoma City.

29-31 Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, Tex.

APRIL

4- 6 Texas Independent Producers and Royalty Owners Association, Rice Hotel, Houston.

5- 7 American Society of Lubrication Engineers, Netherland-Plaza Hotel, Cincinnati.

8- 9 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Townsend Hotel, Casper, Wyo.

12-16 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, and Society of Exploration Geophysicists, annual meeting, St. Louis.

13-15 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

14-16 National Petroleum Association, fifty-first semiannual meeting, Cleveland Hotel, Cleveland.

21-23 Natural Gasoline Association of America, thirty-third annual convention, Baker Hotel, Dallas.

26-28 Southern Gas Association, annual convention, Houston.

MAY

2- 4 Independent Petroleum Association of America, midyear meeting, Cosmopolitan Hotel, Denver.

3- 5 American Geophysical Union, thirty-fifth annual meeting, National Academy of Sciences, Washington, D. C.

6- 7 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Statler Hotel, Los Angeles.

10-12 American Petroleum Institute, Division of Transportation, Products Pipe Line Conference, Warwick Hotel, Philadelphia.

10-13 American Petroleum Institute, Division of Refining, midyear meeting, Rice Hotel, Houston.

17-19 American Petroleum Institute, Division of Marketing, midyear meeting, Cosmopolitan Hotel, Denver.

24-26 American Gas Association, production and chemical conference, William Penn Hotel, Pittsburgh.

27-28 Natural Gas and Petroleum Association of Canada, Prince Albert Hotel, Windsor, Ont., Canada.

31-June 5 American Petroleum Institute, Division of Production, midyear committee conference, St. Francis Hotel, San Francisco.

JUNE

6-11 Society of Automotive Engineers, summer meeting, Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J.

13-18 American Society for Testing Materials, annual meeting and exhibits, Sherman Hotel, Chicago.

17-19 American Petroleum Institute, Division of Production, eastern district meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

20-24 Canadian Gas Association, Banff Springs Hotel, Banff, Alta., Canada.

27

July 1 Petroleum Equipment Suppliers Association, nineteenth annual meeting, Manoir Richelieu, Murray Bay, Que., Canada.

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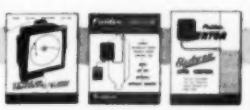

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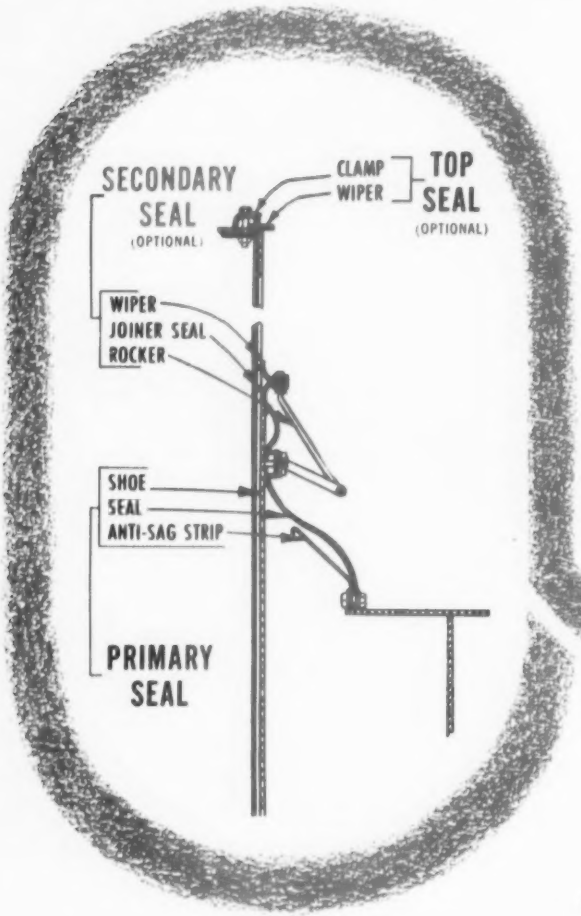
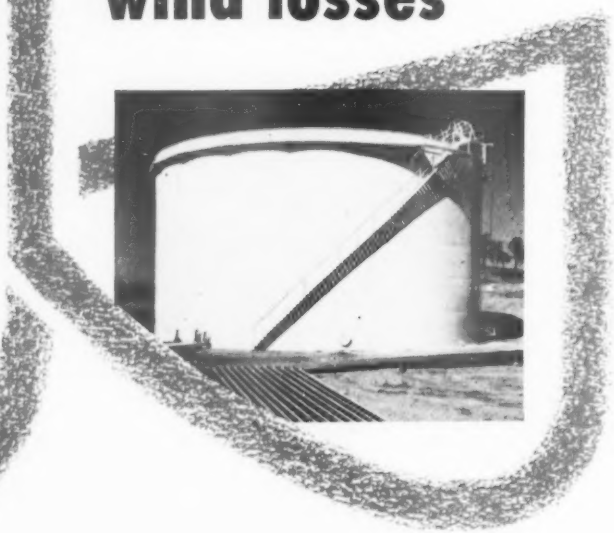


secondary seal to cut wind losses



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TULSA, OKLAHOMA

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JOURNALLY Speaking

Offshore Ingenuity

THE nation's inventors are having a field day dreaming up wierd new devices for drilling oil wells in deep waters of the ocean. All the talk about "oil-rich tidelands" during congressional debates on offshore oil legislation last year called attention to the problems of oceanic oil operations and stimulated free-lance geniuses into accepting the challenge.

As a result, oil companies are being flooded with all kinds of bright ideas and novel approaches. Some of these are utterly impractical, bordering on the crackpot, but many have considerable merit. Many top-notch engineers and marine designers are also working on offshore drilling rigs, men who are well acquainted with the difficulties encountered and the mechanical problems presented.

The objective is to get away from the necessity for building a man-made island or drilling platform in deep water, particularly for wildcatting. What is wanted is a rig which can be towed, complete and ready to operate, and set down in water 30, 60, or 100 ft. deep, and which will remain perfectly stable and stationary while a well is drilled, despite hurricane, hell and high water.

The mechanical monsters which have been sketched out by some inventors would do credit to the imagination of the artists who draw comic books on interplanetary travel. Most of them utilize a floating platform, with various sorts of submersible pontoons, retractable jacks, or spidery legs to set firmly on the bottom and raise the drilling floor above the wave level.

One proposal is for a gigantic "milk stool"—a huge submarine derrick with widespread legs on the bottom and a small platform above the surface on which a conventional derrick and drilling rig are mounted. To keep the contraption from being top-heavy, some designers are playing with the idea of having most of the drilling machinery underslung below the derrick floor. Since this would make it difficult for the driller to see what was going on it has even been suggested that the rig be fitted with a bunch of television sets and remote-control devices.

Still other inventors are starting with a diving bell, and are attempting to design a completely submersible drilling rig which would rest directly on the ocean floor, undisturbed by any storms raging on the surface far above.

There is one big trouble with all the ideas which have come to general attention to date—they cost too much. However sound the plans may be in engineering design and mechanical operation, these huge and complicated offshore rigs would cost a fortune to build. Not many drilling contractors are in a rush to purchase a multi-million-dollar rig and then bid on offshore contracts, in view of the competitive situation in drilling rates today.

Someday, when the price of oil gets higher, many of these bright ideas for offshore drilling may promise a quicker payout than at present. But this doesn't mean that offshore development will languish. Many oil companies are actively working on projects for large-scale development, particularly in the Gulf of Mexico, and it is known that several are building or contracting for rigs which will operate in much deeper waters than heretofore have been drilled except from permanent platforms.

There is considerable secrecy about most of these plans, but so far as can be learned most of these new rigs are simply bigger and better models of the submersible barge which has proved successful in depths of around 20 ft. A lot of ingenuity and skillful engineering have gone into making these rigs capable of operating in waters of perhaps twice that depth, but for the most part they do not incorporate spectacularly radical departures from conventional practice.

But certainly it can't be said that the nation's inventors are ignoring the problem or that oil companies aren't appreciative of this. All companies interested in offshore work will give an attentive ear to anyone with an idea that looks remotely practical. But the dollar sign is still the determining factor.

—Henry D. Ralph.

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The import ruckus is over a small number of barrels

THE running argument over imports of foreign oil may have left the impression that we can't have our cake and eat it too—that we can't maintain a satisfactory market for domestic crude and at the same time attain our national objectives of international trade and defense of the free world.

A few figures should show that we can do both.

There would be relatively little trouble in the crude market today if imports had been held at their 1952 level throughout this year—and the 1952 level certainly did not hamper our foreign policies. All the furor concerns a really small volume of oil, but its cumulative effect has destroyed the supply-demand balance.

Crude imports this year have averaged about 652,000 bbl. per day, which is 15 per cent—or 140,000 bbl. per day—above the 1952 average. Imports of heavy fuel oil have also increased, but this is a separate problem and its impact on the domestic oil industry is debatable.

Stocks of both crude and products are excessive today because for many months running, earlier this year, the entire industry was too optimistic about the quantity that consumers would use. Recently, belatedly, some importers and some producing states have taken corrective measures, with the result that stocks are beginning to dip downward.

During the past 4 months domestic crude production has been cut from its midsummer high of 6,600,000 bbl. per day to nearly 6,200,000. Except for Kansas' dramatic 10-day shutdown, which caused a slight dip in crude stocks, the bulk of this 400,000-bbl. cut was borne by Texas.

HERE'S the outlook now: If demand continues normal, stocks probably can be worked down to manageable levels by spring provided domestic production is permitted to increase only gradually during the next 4 months to no more than about 6,500,000 bbl. per day—and provided imports don't increase.

Any cut in imports now would be a help in correcting the situation. And a cut of 140,000 bbl. per day—back to the 1952 level—for a few months plus continued restraint in increasing domestic output would correct the oversupply entirely and permit resumption of something like normal crude production in the United States by spring.

NO one can contend that the 1952 rate of crude imports was too low to support our trade and defense programs, or that a temporary return to something near that level would impair our national safety this winter.

And it is hard to see how a short-term cut of little more than 100,000 bbl. per day would hurt the economies of exporting nations as much as the economy of Texas is hurting right now. These nations, too, should realize that markets are variable and not an ever-expanding bonanza.

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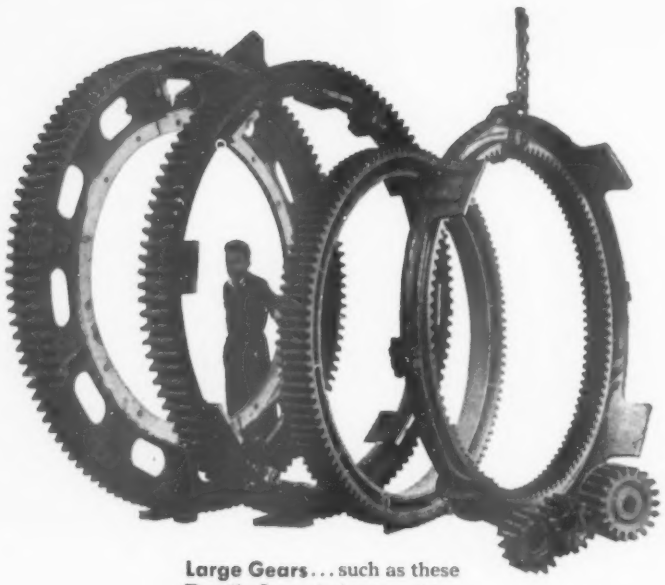

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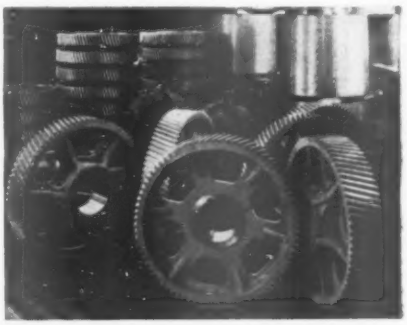

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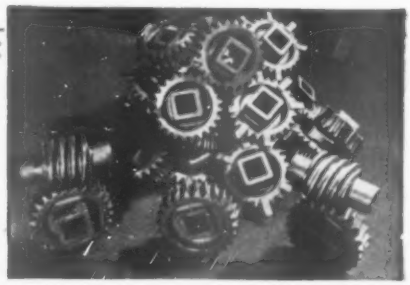

Small Gears ... also worms ... exemplify an application of Ductile Iron in the railroad field.

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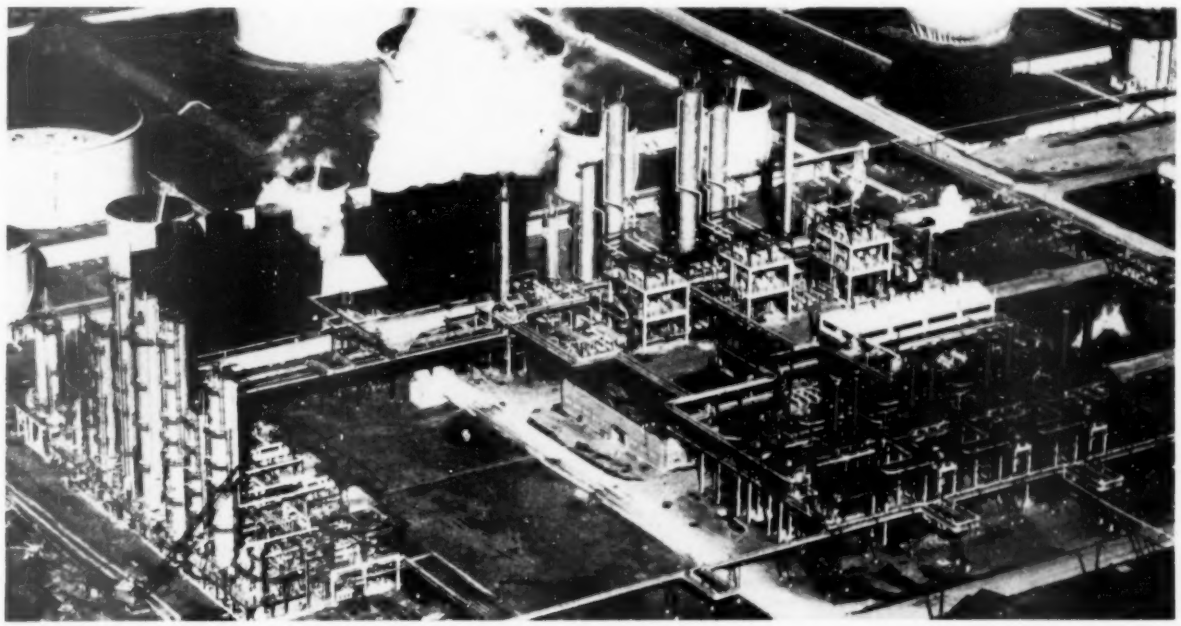
THIS WEEK... ...IN THE NEWS



FIRST PETROLEUM AROMATICS PLANT in the Northeast is now going on stream at Sun Oil Co.'s Marcus Hook, Pa. refinery. The plant also employs the first Houdriformer to reach commercial operation. Plant will alternate benzene and toluene production with xylene output. Its capacity equals 6 per cent of total U. S. output of benzene, 8 per cent of total toluene, 12 per cent of total xylenes.

INTERNATIONAL—Australian wildcat flows 550 bbl. a day, indicating first commercial production on the continent. . . . Operating company, West Australian Petroleum, resumes drilling after thorough testing of 3,605-3,620-ft. interval. . . . Company plans to drill deep enough to thoroughly evaluate the area. . . . ¶Britain, Iran agree to resume diplomatic relations, a step considered an important preliminary to reopening of formal negotiations and eventual settlement of oil dispute. . . . ¶Vacuum Oil Co. nears windup of $33,600,000 construction program at Coryton, England. . . .

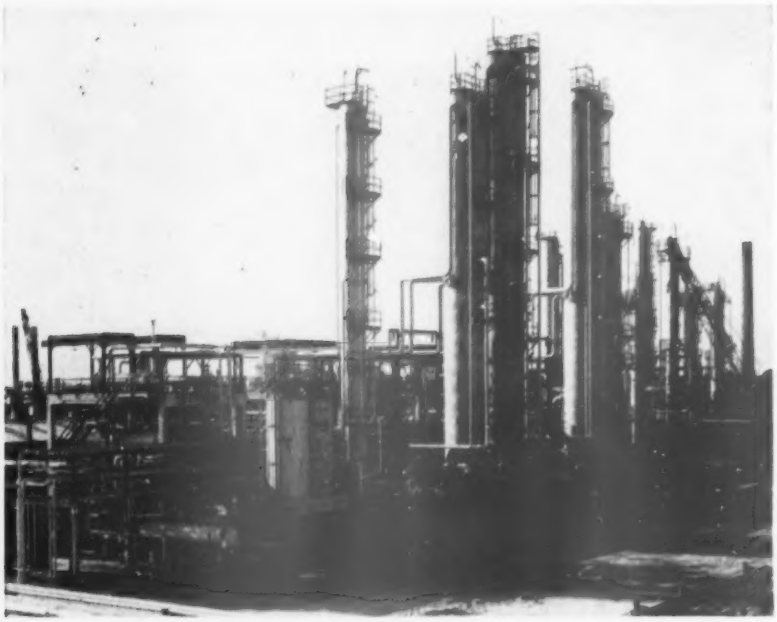
REFINING—The $15,000,000 aromatics plant of Sun Oil Co.'s Marcus Hook, Pa., refinery goes on stream adding Sun to the nation's major producers of petrochemicals. . . . Plant can produce 12 per cent of nation's capacity of benzene, toluene and mixed xylenes from petroleum. . . . ¶Ethyl Corp. announces it will market in February a new haloalkyl phosphorus compound gasoline additive to combat preignition in high compression gasoline engines. . . . The additive, ICC, will be marketed separately from TEL and the price will be 40 cents a pound in carload lots. . . . ¶Union Oil lets contract for construction of a 15,750-bbl. Unifiner at its Oleum, Calif., refinery to C. F. Braun & Co. . . . Unit is scheduled for completion in late 1954. . . .

GOVERNMENT—National Petroleum Council recommends liquidation of Petroleum Administration for Defense. . . . Odds are that remaining duties will be shifted to Interior's Oil and Gas Division within near future. . . . Committee headed by Paul Endacott concludes continued high rate of drilling and exploration activity, or even an increase, will be needed to guarantee national security in event of war. . . . Manpower needs will be high, committee says, and plans must be made to avoid draft errors of last war. . . .

NATURAL GAS—Alberta Conservation Board leaves it up to federal authorities in Ottawa to decide whether prairie gas shall go to eastern Canada via Trans Canada line or to Minneapolis area via Western or to both. . . . Alberta premier recommends that competing companies merge their gas-export proposals and serve both areas, declares surplus gas available for export to the east now totals in excess of 3½ trillion cubic feet. . . . ¶Interstate Oil Compact adopts resolution alerting oil-producing states to danger of Supreme Court refusal to review so-called Phillips case. . . . Cites threat to conservation. . . .

PRODUCTION—Richfield finds world's deepest pay at 17,500-17,895 ft. in an Eocene sand in its deep test in North Coles Levee field near Bakersfield, Calif. . . . Company's 67-29 C.L.A. flowed 68 bbl. of 57°-gravity condensate, with 16.5 per cent water cut, and considerable gas during production tests December 7. . . . General belief is, however, that well will prove uneconomic. . . . ¶North Dakota adopts new set of oil and gas conservation regulations. . . .

ACTIVITY—Production of crude and lease condensate averaged 6,198,625 bbl. daily for week ended December 5, down 28,550 bbl. daily. . . . ¶Total well completions for the week decreased 60 wells to 948. . . . ¶Wildcat completions were up 18 wells to 222. . . . ¶Rotary rigs increased in the United States by 73 during the week ended December 7 to 2,886. . . .



PREFRACTIONATION SECTION separates two narrow boiling range fractions which are rich in the naphthenes which convert to benzene, toluene and xylenes.

Sun Joins Giants

New Marcus Hook aromatics plant can produce 12 per cent of national capacity of benzene, toluene, mixed xylenes

George Weber

MARCUS HOOK, Pa.—With its $15 million aromatics plant now going on stream here, Sun Oil Co. enters the ranks of major petrochemical producers. The new unit employs the first Houdriformer to go into production.

The plant has a designed capacity for producing annually as much as 19 million gallons of benzene, the same quantity of toluene and about 15 million gallons of mixed xylenes. This represents nearly 12 per cent of the national capacity for these aromatics based on petroleum, and about 8 per cent of total capacity from both petroleum and coal tar.

Sun is no newcomer to the petrochemical field. At both Toledo and Marcus Hook the company produces major quantities of propylene tetramer and trimer.

Petroleum sulfonates and a new high molecular weight naphthenic acid which is practically free of oil, are made at Marcus Hook. Toledo supplies the chemical industry with basic hydrocarbons and when a new Platformer is placed in operation, the company will sell by-product hydrogen for manufacture of powdered iron. The new refinery now on stream at Sarnia, Ontario, will also produce basic olefins and paraffins for chemical manufacture in the Sarnia area.

The company plans to diversify chemical manufacture still further. Design work is completed for a proposed ethylene plant to produce 150,000,000 lb. per year of that important building block. Sun has not yet decided when to build this plant, but it is tentatively planned for a New Jersey site already acquired directly across the Delaware River from Marcus Hook.

Ethylene plans . . . This ethylene plant will charge both refinery gas and natural gasoline. The by-product hydrogen, augmenting the 13.5 million cubic feet per day to be produced in the new aromatics plant, will constitute a major source of that gas in the Philadelphia area. To date, Sun has declined to contract its net hydrogen production from the aromatics plant and has plans for utilizing it internally at Marcus Hook, possibly for mild hydrogenation of cracked middle distillates and for combination with basic petrochemicals produced in the refinery.

Sun's new aromatics plant is the only one of its type to be located in the East, which gives the company a favorable marketing advantage over plants more distant from major consumption centers. The Marcus Hook refinery is an ideal source of aromatics, since it charges a high proportion of naphthenic crudes.

The feed stream to the chemical unit represents all straightrun gasoline produced in the 145,000 bbl. per day refinery, plus some natural gasoline. The naphthenic content of this feed runs 40 per cent or higher. This stream will average about 27,700 bbl. per day for aromatics operation. It is pretreated for removal of water and sulfur.

Superfractionation splits the feed stock into six fractions: propane and isobutane; n-butane and pentanes; a 211°-240° F. gasoline fraction; a 265° F. plus naphtha and two narrow boiling range cuts for conversion to benzene-toluene and to xylenes.

Houdriformer flexible . . . For aromatics production, the two last streams are pumped to storage for alternate withdrawal as feed to the Houdriformer unit which will operate on a blocked-out operation.

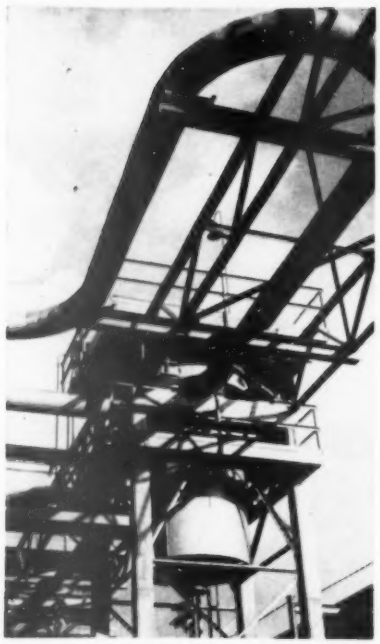
The Houdriformer consists of eight cases arranged for parallel processing of two streams, each of which passes four reactors in series. The fixed-bed reactors contain a platinum catalyst. Process stock is reheated between each reaction stage, and hydrogen, separated after the last reaction step, is reheated before recycling to the first reactor.

Charge capacity of the unit varies with the type of operation. For benzene-toluene operation, the unit is rated for 11,500 bbl. per stream day, for xylene operation, 13,200 bbl. per stream day and when the unit is operated for production of motor gasoline blend stocks, the rated capacity is 14,400 bbl. per stream day of charge.

The unit is flexible in design. Reactor temperatures are maintained above 900° F. Conversion of the 145°-211° F. feed to benzene and toluene requires 300 psi. and the dehydrogenation of heavier naphthenes in the 240°-245° F. feed, to xylenes is carried out at about 500 psi.

All exchangers, heaters and reactors are arranged in parallel so that one half of the plant can be operated at a time. For aromatics production, the unit will be operated about 19 days a month on benzene and toluene and the remainder on xylenes.

Udex extraction . . . The third section of the plant employs Udex extraction,



EIGHT REACTORS on the Houdriforming unit are suspended on ball bearings to accommodate expansion and contraction in the piping. They are located around the outside of the unit to facilitate changing of the platinum catalyst.

licensed by Universal Oil Products Co. This is used for extracting high purity benzene and toluene. The reformate from benzene-toluene production is first depentanized and the bottoms fraction is charged to the Udex extractor where aromatics are selectively absorbed by diethylene glycol. Paraffin fractions which are not absorbed, are withdrawn overhead as gasoline. Mixed aromatics, stripped from the glycol, are first clay treated and then split into nitration grades of benzene and toluene.

During xylene operations, the reformate is fractionated in three stages to separate the mixed xylene fraction from gasoline, naphtha and heavy aromatics. Xylene separation by simple fractionation is possible due to the careful boiling point control held on the Houdriformer feed stock for this operation.

The product is a mixture of ethylbenzene, orthoxylene, metaxylene and paraxylene. At present Sun will market mixed xylenes principally for solvent uses. Separation, which may be undertaken in the future, will permit production of the basic fractions for conversion to styrene, phthalic anhydride, isophthalic acid and Dacron synthetic fiber. Sun research teams are also studying the heavy aromatic fractions produced by both the benzene-toluene and xylene operations, to determine what possible chemical end uses they might offer.

Long-range confidence . . . Although Sun's initial production now faces a fairly soft aromatics market, the company expresses full confidence in the long-range demand picture. Petroleum benzene, in ample supply, still brings 50 to 55 cents per gallon, while coke-oven product was reduced 2 cents at three eastern points last week to 40 cents per gallon. Government purchases of toluene for avgas and TNT production account for the bulk of current production, and the supply has not eased as was anticipated earlier this year.

The Sun plant is sufficiently flexible to adjust operations to meet variations in demand for the three basic aromatics. The plant can also be operated to produce high octane blends for avgas and motor fuel.

Sun engineers designed the plant, and the Houdriformer was adapted by the licensor, Houdry Process Corp., to meet a wide range of petrochemical and high octane reformate requirements.

Has Oklahoma Learned?

Editor and governor disagree on how well state has employed conservation lessons of Oklahoma City field

Henry D. Ralph

OKLAHOMA CITY. — A difference of opinion as to how well conservation lessons have been learned from the history of the Oklahoma City field was aired at the winter meeting of the Interstate Oil Compact Commission here December 4-5.

Claude V. Barrow, veteran oil editor of the Daily Oklahoman, told the commission that Oklahoma has not yet learned how to stop the ruthless waste of natural gas, nor is it doing all it should under the Compact to regulate oil production.

On the other hand, Gov. Johnston Murray of Oklahoma declared that all the aims of conservation which were developed during the hectic days of the 1930's are being accomplished quite effectively in this state.

The Compact Commission's meeting coincided with the twenty-fifth anniversary of the discovery of the Oklahoma City field, the development of which was marked by town-lot drilling, oil and gas waste, overproduction, 10-cent oil, martial law, hot-oil running, early conservation experiments, and finally the formation of the Interstate Oil Compact Commission.

For this reason the history of this field and the lessons learned from it were reviewed by a number of speakers.

Praise from Murray . . . Governor Murray, whose father, Gov. (Alfalfa Bill) Murray, enforced conservation with bayonets, praised the results of state conservation under the Compact and reviewed its benefits to his state, saying:

"We want to prevent the operation of wells with inefficient gas-oil ratios. We want to prevent the escape of gas into the air or its wasteful burning. And we want to eliminate fire hazards, price fixing, and any efforts which may be made toward establishing monopolies.

"Thus far, all these aims are being accomplished quite effectively. Oklahoma is grateful for the benefits, and extremely proud of the important part she has played in the founding and continuation of this sensible program of preventing waste in the oil industry.

"We work together in a spirit of full cooperation. All who have followed our activities from the beginning will agree, I'm sure, that we have done extremely well. And I, for one, am convinced that we will do even better as the years roll by."

Criticism from editor . . . Barrow also recited a long list of benefits learned by the industry and the state from experience with the Oklahoma City field, and then added: "But there is one lesson we have not learned: How to stop the ruthless waste of natural gas."

He quoted the U.S. Bureau of Mines as reporting that in 1952 Oklahoma wasted 520 million cubic feet of gas per day, or about 34 per cent of the quantity marketed. In 1951 the state wasted only 417 million feet a day, or 30 per cent of that marketed.

Turning to the current oversupply of crude oil in United States, Barrow declared that Oklahoma has only 5.57 per cent of the nation's reserves but accounts for 8.36 per cent of production and Oklahoma crude oil in storage is 10.63 per cent of the total. He quoted former Governor Marland of Oklahoma as saying when the Compact was first approved:

"Under the Compact, if a state permits its fields to run wild, that state is breaking faith not only with the federal Government but with its sister states."

Imports rear head . . . The outgoing

chairman of the commission, Gov. Edward F. Arn of Kansas, called on the Compact Commission and the Department of the Interior to do something about imports of foreign oil.

"For many years," he said, "our market-demand proration program has stabilized the supplies and avoided above-ground physical and economic waste. But today this program is thrown out of balance at least in part by the great increase in foreign imports of oil.

"We must maintain an adequate balance between production and demand. Oil production cannot be half controlled and half free. The continued unrestricted foreign imports could wreck the American oil industry. Somewhere there is a happy balance between imports and domestic production that will not demoralize the American market."

Arn also said that the Compact states should do more about the problem of preventing economic waste, but he warned that this must be accomplished by a program of explaining conservation to the public. He said:

"The people cannot comprehend that economic as well as physical waste is created when small, old, or marginal wells are abandoned without a complete recovery of the oil. This premature abandonment is a direct result of the marginal well's inability to compete with the flush production of new wells.

"The fact that proper regulation of such economic waste must be made by our conservation bodies is not apparent to the public. Therefore, when our regulatory bodies assert their power over economic waste, such agencies often are subjected to public criticism."

As its officers for 1954 the commission elected Governor Murray, of Oklahoma, chairman; Doxie Moore, Indianapolis, director of conservation for Indiana, first vice chairman; and James D. Conway, Hastings attorney and official representative from Nebraska, second vice chairman.

Gas Revolt Predicted

I.O.C.C. told FPC control resulting from Phillips case will result in less gas at higher prices to the consumer

OKLAHOMA CITY.—The Supreme Court's refusal to review the decision in the case of Phillips Petroleum Co. and the Federal Power Commission will reduce gas rates to consumers temporarily but within a few years many consumers will have less gas and be paying much higher prices for it, the Interstate Oil Compact Commission was told by C. H. Hinton of Panhandle Eastern Pipe Line Co.

As long as that decision stands, he said, every major and minor producer is classed as a "natural gas company" and will be allowed to make only 6½ per cent net income on the value of his property as determined by a utility formula. He continued:

"The FPC has also assumed jurisdiction over revenues derived from natural-gasoline plants in several rate cases and used such revenue to reduce the operating production costs.

"Oil companies delivering residue casing-head gas to an interstate pipe line can now expect a diminishing regulated revenue from a disappearing gasoline-plant rate base and a divided investment on the casing-head well. Here FPC ignores the fact that natural gasoline is sold at fluctuating prices over which it has no control."

Contract void? . . . Hinton said that such regulation will most certainly slow down drilling activities drastically, and producers will no longer be willing to sell to interstate lines. He then raised the prospect of an immediate curtailment in supplies to interstate lines, saying:

"Most gas purchase contracts which have been made during the past few years between producers and interstate pipe lines contain provisions that such contracts are void if the FPC should assert jurisdiction over the producer.

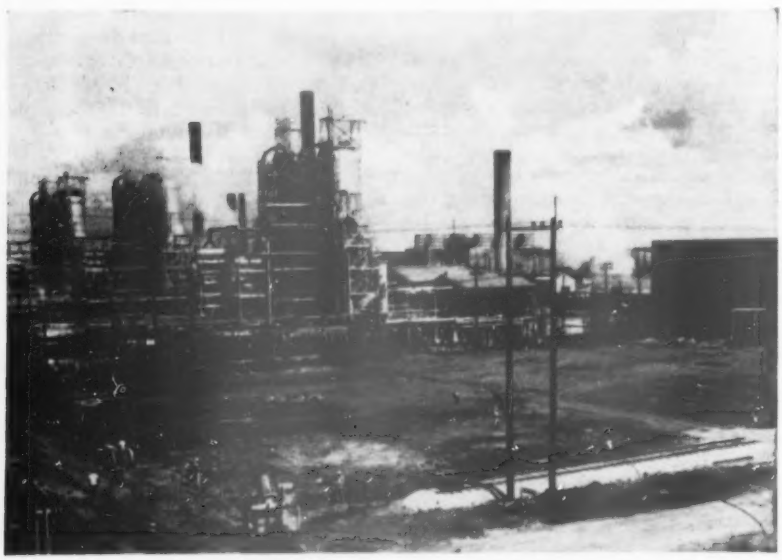
"The exercise of these escape clauses by the producers will create an immediate shortage of gas to pipe lines.

"It will be virtually impossible to complete a gas purchase contract for an additional supply of natural gas to an interstate pipe line. Natural gas is much too valuable as a petrochemical raw material for a producer to sell on an FPC regulated basis.

"So what has happened to the consumer? A battle has been won by shortsighted regulators but a victory has been lost for the consumer."

Hinton amplified his conclusions by citing examples from the accounts of hypothetical gas producers and pipe lines to show how the FPC accounting and regulatory practices will result in curtailing the supply of gas.

The FPC-Phillips decision was the chief topic of discussion at the commission's legal committee, and there was general agreement that FPC regulation would be a serious setback to conservation and an interference in state regulation of oil and gas production. The group adopted a resolution calling this situation to the attention of all oil-producing states and expressing the hope that the decision now standing will be set aside.



Baytown Refinery Makes Room for New Unit

When a fourth 75,000-bbl. per day crude unit is erected on the cleared area in the foreground, Humble Oil & Refining Co. will have lined up 300,000 bbl. per day in crude capacity, at the Baytown, Tex., refinery. The new unit, like the other three, will be designed and built by Foster Wheeler Corp.

Oversupply Worse

Supply reductions in 1954 mandatory, Compact told

OKLAHOMA CITY.—The oversupply of petroleum in the United States has become worse during the fourth quarter of this year, and further reductions in supply must be made during 1954, the Interstate Oil Compact Commission was told by Harold B. Fell, chairman of the supply and demand committee of the Independent Petroleum Association of America.

Earlier forecasts, he said, recommended that stocks of crude and products be reduced by around 56,000,000 bbl. during the fourth quarter of 1953 to a level of 693,000,000 bbl. by December 31. Instead, he reported, stocks have increased during recent months with the result that heavy reductions will have to be made during the first quarter of 1954 in order to bring inventories down to 652,000,000 bbl. by March 31 unless they are to be excessive.

Refinery runs up . . . In site of a decrease in demand below the expected rate, Fell said, refinery runs have increased recently, thus aggravating the situation and producing more than adequate stocks of refined products for the winter season.

Demand in recent weeks has been at least 300,000 bbl. per day below the anticipated level, but supply has been cut only half that much, Fell declared. Unless something is done to correct this, he said, the outlook for 1954 will be a further dangerous accumulation of excess inventories of both crude and products.

This means, Fell warned, that if imports continue at their present rate domestic production will have to be held very considerably below the average of 6,600,000 bbl. per day which his committee earlier had believed could be achieved.

U. S. Petroleum Supply and Demand Forecast

(Thousands of barrels daily, except closing stocks)

	1953			1954				
DEMAND	**Third quarter***	**Fourth quarter**	**Year**	**First quarter**	**Second quarter**	**Third quarter**	**Fourth quarter**	**Year**
Gasoline	3,665	3,415	3,470	3,265	3,775	3,830	3,560	3,607
Kerosine	330	500	364	520	235	225	495	369
Distillate	995	1,825	1,488	2,170	1,180	1,035	1,890	1,568
Residual	1,445	1,770	1,651	1,845	1,515	1,425	1,735	1,631
Other products	1,285	1,115	1,153	1,055	1,165	1,280	1,125	1,157
Total	7,610	8,625	8,126	8,855	7,870	7,795	8,805	8,332
EXPORTS (included above)								
Gasoline	90	85	96	85	85	80	80	82
Kerosine	20	15	20	15	15	15	15	15
Distillate	90	80	94	80	80	75	70	76
Residual	65	55	65	60	55	50	45	53
Other products	60	55	60	55	55	55	50	54
Crude	60	50	62	50	45	40	40	44
Total	385	340	397	345	335	315	300	324
DOMESTIC DEMAND	**7,225**	**8,285**	**7,729**	**8,510**	**7,535**	**7,480**	**8,505**	**8,008**
TOTAL STOCK CHANGE	**+535**	**—543**	**+52**	**—456**	**+396**	**+478**	**—348**	**+19**
TOTAL NEW SUPPLY REQUIRED	**8,145**	**8,082**	**8,178**	**8,399**	**8,266**	**8,273**	**8,457**	**8,351**
CLOSING STOCKS (millions of bbl.)								
Gasoline	142	146	146	167	151	138	147	147
Kerosine	37	26	26	16	27	37	28	28
Distillate	127	103	103	54	84	125	102	102
Residual	52	44	44	38	44	53	47	47
Other products and natural gasoline	101	99	99	102	107	104	101	101
Crude	284	275	275	275	275	275	275	275
Total	743	693	693	652	688	732	700	700
RUNS TO STILLS	**7,075**	**6,929**	**6,993**	**7,115**	**7,148**	**7,209**	**7,204**	**7,169**

*Estimated. Based on Bureau of Mines figures for July and A.P.I. figures for August and September.

Secondary Recovery

I.O.C.C. reviews benefits, problems of recovery plans

OKLAHOMA CITY.—Problems and benefits of secondary recovery featured a large number of the papers presented at committee meetings of the Interstate Oil Compact Commission here December 4-5.

Benefits to the state were reviewed by Roy J. Turner, of Harper-Turner Oil Co. and former governor of Oklahoma, who said that in this state the oil produced purely by secondary-recovery operations totaled 12 million barrels in 1951, 23 million barrels in 1952, and will be considerably greater in 1953. The state benefited directly by collecting more than $4,500,000 in gross production taxes on this oil in each of these years, he said.

Royalty owners . . . Secondary recovery from the standpoint of the royalty owners was discussed by George V. Labadie of Pawhuska, Okla., a member of the Osage Indian Tribal Council. Osage Indian lands were the scene of a flush-production boom years ago and are the site of extensive waterflood operations.

Labide explained that the tribe consented to lowering its royalty rate in order to encourage water flooding and as a result it has benefited by a higher total of royalty payments and assurance of increased production for many years from tribal lands.

Unitization problems . . . Unitization is the biggest problem in secondary recovery, William L. Horner, vice president of Sunray Oil Corp., Tulsa, declared, pointing to the difficulties of conducting a successful operation without a unit plan.

Unitization offers attractive benefits to regulatory bodies and should be encouraged by them, Horner said, even though they present new problems and often additional work.

Selling unitization . . . A good program of information is the best way to secure the cooperation of royalty owners in agreeing to a unit plan of secondary recovery, said H. W. Penterman of Shell Oil Co., Tulsa.

First, Penterman warned, a unit plan should be abandoned unless engineering studies can promise a very definite economic gain. He also advised that the formula for individual participation be kept flexible at the start and the engi-

neering data be reevaluated annually for 3 or 4 years in order to determine the economic benefits accruing to each participant.

On his own experience in putting together many unitized projects, Penterman said that after the best possible engineering and legal plans have been worked out, the main problem is in helping the participants to formulate their business judgment. To do this, he said, it is necessary to develop a simple, concise explanation of the plan in a manner which can be understood by the royalty owners, and then to present this in such a way that they can readily see how they can expect more income from its adoption.

Ethyl to Market "ICC"

Firm says haloalkyl phosphorus compound in gasoline cuts high compression engine preignition, plug fouling

George Weber

NEW YORK.—Ethyl Corp.'s new preignition gasoline additive, ICC, will be marketed February 1.

The new additive, described by Ethyl as a haloalkyl phosphorus compound, will be marketed to refiners for blending motor fuel to combat preignition and spark plug fouling in modern high compression cars. It will be sold separately from tetraethyl lead.

Limited shipments of the compound have already been made to numerous oil companies for laboratory and road testing. On the basis of Ethyl's research with single and multiple cylinder lab tests and with fleet operations, the company says that the ignition control compound is the most effective of all compounds it has tested.

Ethyl announced the new preignition additive will sell for 40 cents per lb. in carload lots and 41 cents for less than carload lots. All shipments will be made in 55-gal. drums. This price averages a little over one-tenth of a cent per cubic centimeter. The company is continuing its development work along this line and has made patent applications covering this particular compound and others.

Ethyl's test program was based on the use of 20 per cent of the theoretically required amount of phosphorus compound plus 3 cc. of TEL per gallon. This amounted to a concentration of 0.55 cc. of the ignition control compound per gallon. This is the concentration Ethyl recommends, but companies purchasing the compound may, on the basis of their own research, modify the dose to meet their individual requirements.

While the company does not claim to have eliminated two problems arising from combustion chamber deposits, it does say that it has an additive which will control them to a practical extent. Spark plug fouling can be alleviated sufficiently to increase mileage before fouling substantially.

They also found that the additive served to reduce preignition to a point which eliminates it as a limiting factor in the operation of some new high compression automobile engines. This would permit refiners to revert to fuel octanes to satisfy only the knock or autoignition requirements of their customers' cars without having to add octanes which suppress preignition but contribute nothing to engine power.

In this reasoning they follow the additive camp in the industry which feels that higher "preignition" octanes are unnecessary and wasteful. On the other side of the picture, some refiners marketing high octane premium gasoline state that their fuel satisfies both knock and preignition needs at the present, and see no need for additives.

Side effects . . . In testing the new additive, one of the first things Ethyl looked at was the compound's side effects on engine durability—with particular attention to exhaust valve life. No adverse effect was noted under ordinary operating conditions. Since some effect showed up in severe operating conditions, engineers conducted their road tests under conditions purposely designed to magnify any differences between fuel treated with their compound and the same fuel without the additive.

A passenger car fleet was operated 24 hours a day, 5 days a week, averaging 55 miles per hour with a simulated full passenger load. Of this mileage, 20 per cent was at wide-open throttle on grades. Two makes of cars with the new V-8 engines were included in the road tests.

A number of cars of each make were run with leaded fuel with and without the additive until exhaust valve failure occurred. They found, not surprisingly, that the effect varied with the make of car. One car showed no adverse effect on exhaust valves while another showed valve life reduced about 70 per cent with the additive. In view of the extreme severity of the test conditions, they concluded that this side effect would not be significant in any normal passenger car operation.

Preignition reduced . . . Preignition tests ranged from the laboratory to the road. In their first evaluation step in single cylinder laboratory engines, Ethyl research teams found that on the average, the compound reduced the preignition count to 30 per cent of that obtained with the same baseline fuel without the additive.

The next step was dynamometer tests on multicylinder engines, which duplicated light duty passenger car operation. For this test several high compression V-8 engines of one make were used. The effect was determined by accumulating deposits with and without additive, and then finding out what octane number fuel was needed to overcome preignition for both cases.

Results of these tests showed that on the average, a reference fuel of 93½ octane number was needed to suppress preignition after operation without the additive. After using the same fuel with the additive, an 88½ octane number fuel suppressed preignition.

Final evaluation took place on the road, using late model premium fuel cars of two makes. Two fleets driven by professional drivers were tested in Detroit and San Bernardino in slow speed metropolitan areas. Limited to a maximum speed of 40 miles per hour, this type of operation was picked as the one most conducive to deposit accumulation.

As in the dynamometer tests, deposits were allowed to accumulate with and without the additive, then the cars were switched to reference fuels to determine the octane number necessary to suppress preignition. The additive reduced this requirement from 91 to 85½ octane number. Since the knock requirement stood at 88, the additive proved effective in reducing the preignition requirement well below that point, assuring full utilization of the baseline fuel octane. This, and not the complete elimination of preignition, is the aim of the additive, since the fuel octane necessary to meet the knock requirement also successfully suppresses preignition.

Plug fouling . . . During the preignition tests the effect of Ethyl's additive on spark plug fouling was also evaluated. In the road tests, researchers found that in cars of one make the additive more than doubled relative miles to fouling, while in the other make, the improvement was more than five times.

The tests also proved the additive's ability to correct preignition and plug fouling which already exist in a car,

without the necessity for removing spark plugs or cleaning out engine deposits. Two to three tankfuls of additive gasoline are considered sufficient to control preignition and to return fouled plugs to normal operation.

Octane vs. Additives

Octanes are hiked to meet competition of "alphabets"

THE marketing of Ethyl's new gasoline additive early next year will broaden the field of "alphabet" gasolines and will include a great many more refiners in scramble for public acceptance.

Since Shell Oil Co. introduced tricresyl phosphate (TCP) last summer, the competitive parade has been joined by a spate of new alphabet gasolines. Contintental Oil Co., under a licensing agreement with Shell, also markets TCP.

Other companies using the phosphate compound and others have introduced a number of alphabet brands. These include Jenney Manufacturing Co., major New England marketers; Cities Service Oil Co.; Globe Oil & Refining Co.; Petco Corp.; Deep Rock Oil Corp.; Frontier Refining Co., Denver; and Sunset Oil Co., California.

This rash of new gasolines has had the effect of increasing premium-fuel octanes in the camp of refiners who are trying to meet preignition requirements with higher octanes.

Examples of this trend can be found in three different sections of the country. On the East Coast, Esso Standard Oil Co.'s new premium fuel has an octane number of 95 and in some engine laboratories samples of it have tested 96 or better. In a fairly limited market in Michigan, Leonard Refineries, Inc., has stepped out with a 96-octane grade. In Southern California Rothschild recently added a new superpremium 95-octane grade which the company will market with its premium grade and in some stations, a third regular grade.

New octane capacity . . . The potential for increasing gasoline octane will rise substantially during the next year. On the basis of catalytic reforming alone and excluding plants planned for production of aromatic chemicals, the nation's capacity will increase almost fivefold by the end of 1954. Currently, 25 catalytic reforming units are operating in this country for the production of about 50,000 bbl. per day of reformate for gasoline blending. Contracted are 49 more units with a total charge capacity of over 415,000 bbl. per day.

The commissioning of these new reformers coupled with expansion in catalytic cracking and auxiliary processing units will permit additional refiners to join in the superoctane race. The extent to which this will take place cannot be gaged since individual company plans are not made public in advance, but the competitive situation will incite some who have the ability to market higher octanes, to do so.

But preignition additives now available, plus new ones which will be introduced in the next few months may modify the so-called octane race next year. The decision whether to adopt the additive route, or to resort to higher octanes will be based on each individual company's position and on the incremental cost involved. The preignition additive is already established as a new dimension in motor fuel quality. It will not halt the trend to higher premium grade octanes, but it may reestablish the octane level in a number of gasoline brands on the basis of knock requirement.

Price spread . . . Since most of the new additive fuels and some of the superoctane grades are selling above the premium price, a greater spread between premium and regular gasoline is in prospect. This trend is hailed by a number of companies who believe that it should reflect a wider price spread at refineries. Support is gaining for the school of thought that motorists buying new high compression cars should and would be willing to pay more for their premium fuel.

Beating Corrosion

Program can be tailored to fit each area problem

THE severity of internal corrosion in oil production equipment may be anticipated from study of the corrosivity of the different oil-producing areas of the nation, D. A. Shock of the Continental Oil Co. told a conference of corrosion men at Norman, Okla.

Shock classified the general types of corrosion in production equipment as sour crude, sweet oil, and condensate corrosion, and pointed out that geographic location of these various types can be definitely correlated. The producer may initiate at the outset of his operation a corrosion mitigation program tailored to the specific problems of his area.

Gaseous inhibitors . . . Speaking before the same group, P. D. Muir of Dowell Incorporated, reported recent tests indicate vapor phase inhibitors may find a valuable place in corrosion control for oil and gas wells. Muir emphasized that an inhibitor must reach the proper point in a well to effectively reduce corrosion; therefore, the physical properties of the material can be as important as the chemical properties. Vapor phase inhibitors may prove an effective method of reaching the "proper point" in some wells.

It is extremely important that the operator check the degree of protection he is receiving from his mitigation program, Muir said. Because none of the methods is infallible, Muir advised using a combination of the iron content test, coupon tests, and caliper logs.

To get dollar value . . . The corrosion

Standard-Vacuum Will Move to Suburban Home

This sketch is of the new headquarters office building to be built by Standard-Vacuum Oil Co. in suburban Westchester County north of New York City. The structure, to be located on a 55-acre site in Harrison, N. Y., will provide 200,000 sq. ft. of office space for the 700 persons in Stanvac's headquarters. It will cost more than $5,000,000 and be finished in 1955. The company carries on integrated operations entirely abroad in the Eastern Hemisphere east of Suez. It will be the only large oil company headquartered in New York to have its offices in the suburbs rather than in the city itself.

men were told by W. T. Thies, of Cook Paint & Varnish Co., that to get full value for every dollar spent on protective coatings, they must carefully select the places protective coating is to be applied, get the proper material to do the job, and then get it applied properly.

One of the newest and most promising methods of getting a paint coating applied properly, Thies reported, is an airless spray. The paint under high pressure and temperature is forced through a nozzle in the gun so that a very good breakup of material is obtained. Very heavy films with little overspray are possible, Thies said.

The December 1 to 4 gathering of corrosion engineers was sponsored by the Extension Study Center of the University of Oklahoma and was addressed by 16 corrosion control experts.

Residuals Look Better

Heavy fuels may see wider use in gas turbines as new additives give partial solution to corrosion, deposits

George Weber

NEW YORK.—Heavy residual fuel oil is getting a better name in gas turbine circles.

The improvement is due mainly to new additives which are alleviating some of the major problems standing in the way of this new potential use for residuals.

However, there is still much room for improvement. If the gas turbine is to fulfill its promise as a new power source with wide economic justification, it must be made more compatible with low cost fuel. This will take the concerted action of turbine designers, metallurgists and oil refiners.

The newly acquired respectability of residuals may be short lived too, because instead of becoming more suitable for turbine fuel, residuals will become less suitable. Refiners will continue to concentrate on higher yields from this low-value product, multiplying the problems involved in the use of the remaining fractions.

This was the consensus of a panel session at the annual meeting of the American Society of Mechanical Engineers. Represented were manufacturers, users and refiners.

The relatively optimistic outlook is in contrast to some dim views which have been taken regarding residuals by some observers during the past year or more. If, as it now appears, this unwanted fraction does show promise of use in gas turbines, it is good news to refiners. The improved potential demand is not restricted to gas turbines, for the problems limiting this end use are similar to those which have worked against wider use of residual fuels in high temperature steam generation. Hence, it would appear that benefits forthcoming from gas turbine research may spread to enhance the position of this low value product for other fuel uses.

Corrosion problems . . . B. O. Buckland of General Electric Co., Schenectady, noted that the corrosion phase of the problem is the first limiting factor in a residual fuel, and the ash deposit is the second limiting factor. He outlined a fuel oil ash relationship which G-E will recommend for its gas turbine units.

In summary this specifies that both sodium and calcium content must be 10 p.p.m. or less. The recommended sodium-to-vanadium weight ratio is equal to or less than 0.3 and the manganese-to-vanadium weight ratio is equal to or greater than 3.0.

Magnesium, he reported, has been found to be better than calcium for inhibiting the highly corrosive action of vanadium pentoxide. Some refiners are now preparing to deliver residual fuel oil meeting these specifications.

A. E. Hershey of Westinghouse Electric Corp., East Pittsburgh, reported attractive results from ash fusion tests on a number of high vanadium and high sodium fuels with certain additives. On the basis of these encouraging findings, he reported his company is continuing the study.

Further optimism was voiced by F. Fahland of Union Pacific Railroad which has operated 10 gas turbine locomotives, including 8 on modified Bunker C fuel. Reviewing nearly 2 years of revenue operation with this new type of motive power, he concluded that two areas remain open to improvement—design of mechanical equipment and fuel characteristics. The filter problem is an important one at present and its solution would go far in making available residual fuels more attractive in this type of operation. Union Pacific's operations with gas turbines fueled with propane and distillate diesel fuel resulted in good service at a higher fuel cost, however.

Metallurgy picture . . . Metallurgists generally have a negative picture to present, said C. T. Evans of Universal-Cyclops Steel Corp., Bridgeville, Pa. No metals or alloys or combination with ceramics yet offer an over-all solution to the problem. He noted, however, that the Swiss had reported several hundred hours of satisfactory service with a stationary gas turbine fueled with high vanadium and sodium content residual containing an unrevealed additive. The British are working on additives promising corrosion relief and have narrowed their research to magnesia, alumina, zinc oxide and certain silica and silicate materials.

Problems to increase . . . The problems involving satisfactory use of present residual fuels for gas turbines are not as great as they will be, said C. W. Hoffman of Socony-Vacuum Oil Co., Inc., Paulsboro. The economic necessity for reducing yields of this low-valued product will tend to concentrate in the remaining fractions, those metals which now pose the greatest problems in turbine operation. He projected over-all refining operations to 1970 by which time the residual yield will drop from the present 18 per cent to about 9 per cent on crude. This residual fraction will gradually increase in viscosity, carbon residue, pour point, and sulfur and ash contents, but may still prove usable as gas turbine fuel if sufficient technical progress continues on the part of designers, metallurgists and refiners.

Industry Briefs

LOS ANGELES.—The Avila, latest tanker to be built for Union Oil Co. service, will be launched December 16 at the Bethlehem-Sparrows Point shipyard. The 17,850-ton vessel, with a capacity of 143,000 bbl., was built for Pico Tanker Co. and will be chartered to Union for 20 years. The $6,100,000 ship is virtually a sister ship of the Santa Maria, which completed its maiden voyage in June 1952.

VENTURA, Calif.—Formal opening of Shell Chemical Co.'s new $10,000,000 ammonia plant was held here December 11. With an output of about 150 tons daily, the new installation makes Shell Chemical the largest producer of anhydrous ammonia and ammonium sulfate west of the Rocky Mountains.

Superior Oil Co. has closed its offices in Wichita, Kans., with its personnel being transferred to the company's offices in Oklahoma City and Denver.

Wartime Needs Cited

Industry must have materials and manpower for new wells to furnish expanding production, NPC committee reports

WASHINGTON. — The oil industry must have materials, equipment and manpower to replace declining and depleted wells with new ones and maintain oil and gas production on an expanding basis in case of war.

This, in essence, was the report of a National Petroleum Council committee made to the Interior Department after a study of minimum requirements for all phases of exploration and development. The committee, headed by Paul Endacott, president of Phillips Petroleum Co., warned that the supply of oil in war will be directly affected by the amount of exploration and drilling carried on and recommended a continuous or "even increased" program of exploration and drilling in case of war.

"Serious consequences would be suffered from the lack of oil if a short war were assumed and a more extended emergency occurred," the committee said.

"Finding new oil and gas reserves can be expected to become increasingly difficult since areas to be explored are generally more inaccessible and producing formations will be found at greater depths. Therefore, as exploratory activities rise, ever increasing quantities of materials and greater manpower must be devoted to these operations."

Variables . . . The committee surveyed drilling and production operations on the basis of 1952 figures plus 10 per cent, but warned that any later calculations of need must be made to fit conditions that will exist in the future.

The committee said while it could compute the 2,106,000 tons of tubular goods and the 1,085,000 tons of other specialized steel used by the industry in 1952, many other items are supplied by so many industries, total requirements cannot be readily determined.

These miscellaneous items used throughout the industry in various volumes, however, are operating necessities and the lack of one seemingly insignificant item may shut down an entire exploration, drilling or production operation.

Alloys are critical to the operation of oil field equipment, the committee pointed out. Substitutions for alloys made during World War II resulted in increased tonnages of steel used, slowed down operations and lowered oil production rates. In addition many items of relatively small volume are essential to seismograph operations and are of the type in critically short supply during an emergency.

Here's what the committee considers minimum requirements based on 1952 uses plus 10 per cent:

Steel . . . The industry used 3,191,000 short tons of specialized steel, including 2,106,000 tons of oil country tubular goods and large quantities of repair and maintenance material in 1952 to drill new wells and maintain 464,000 producing oil wells and 66,000 natural gas wells.

An increase of 10 per cent in the well drilling rate would require at least an additional 10 per cent of steel and more if deeper drilling necessitated an increase in the 11.3 tons of steel per 1,000 ft. drilled in 1952.

Rigs . . . Last year there were 2,642 rotary and about 1,500 cable tool rigs in operation. Anticipating that any increase in drilling will come from rotaries, the committee estimates 3,000 rotary rigs and 1,500 cable tool rigs will be required to increase operations 10 per cent over 1952. Over-all requirement for related drilling materials would increase by the same ratio. To maintain uninterrupted activity at the 1952 level, 450 rotary rigs must be replaced annually.

Manpower . . . Total manpower last year for exploration, drilling and production was 311,000 with production accounting for 56 per cent of the total. The committee set manpower requirements at 332,000.

To maintain the 1952 rate of 46,000 wells it will be necessary for the industry to operate 650 seismograph and 100 gravity meter crews every month throughout each year.

Of the 42,000 persons in exploration activities last year, 11,000 were geologists and geophysicists and 4,000 were scouts and landmen. Studies indicate the industry will need geologists and geophysicists faster than educational institutions can graduate them.

About 95,000 persons were employed in drilling in 1952. The department was warned the industry cannot again afford to lose its drilling manpower as it did during World War II because of improper draft classification of drilling personnel.

Approximately 165,000 persons were engaged in production operations on the 464,000 active oil wells last year and the number of producing wells is increasing 3 per cent each year. Of the manpower total, 136,000 were in direct producing activities, 3,000 were in supervisory and technical development work and 26,000 provided the necessary services and supplies.

Another 9,000 employes were used in 1952 to produce natural gas from the 66,000 operating gas wells in the country.

The committee concluded with the reminder that as exploration, drilling

Sugar Creek Refinery Has New "Nerve Center"

Engineering, research and administrative facilities of the Sugar Creek, Mo., refinery of Standard Oil Co. (Ind.) are now housed in a new completely air-conditioned, three-story building. The new structure is built step-wise on a hillside with engineering and research personnel occupying the first two floors and management officials the third.

and production become more difficult, manpower and materials for research will play a larger part in increasing the recovery of oil.

"An increasingly important and necessary part of the exploration, drilling and production branches of the industry are the many service and supply companies which furnish specialized tools, equipment and supplies as well as highly trained personnel," the committee added.

PAD Finishing Job

Final NPC meeting recommends OGD of Interior take over; proposes action to solve mining vs. oil lease conflict

WASHINGTON.—Only the paper work and formalities of transferring activities to a successor agency stand in the way of complete liquidation of the Petroleum Administration for Defense.

That successor will probably be the Oil and Gas Division of the Department of Interior.

Interior Secretary Douglas McKay is now considering a plan for reactivating the OGD and the Military Petroleum Advisory Board as recommended by the National Petroleum Council in its final meeting of the year last week.

The council cleaned its slate of all tasks entrusted to it, submitting reports, in addition to that on PAD, on the material and manpower requirements of the exploration, drilling and production branches of the industry and changes in federal law and policy necessary to permit simultaneous oil and mineral development on government lands.

Military representatives attending the meeting said the armed forces now are in very good position so far as oil supplies are concerned. They disclosed that requirements for jet fuel next year will jump possibly as much as 35 per cent, but with no lessening in demand for aviation gasoline. They believe there will be no difficulty in meeting requirements.

In its report on government organization, a council committee headed by B. Brewster Jennings, president of Socony-Vacuum Oil Co., Inc., emphasized the desirability of having a principal point of contact and cooperation between the Government and the oil industry and said that because of the knowledge the Interior Department has gained in oil and gas matters in the past 10 years it should continue to hold responsibility.

It called for reactivation of the Oil and Gas Division and the Military Petroleum Advisory Board and continuation of the National Petroleum Council. In the event the Foreign Petroleum Supply Committee is to be continued—and continuance is desired by the military—it may be necessary to revise the voluntary agreement under which it operates.

The OGD would have reassigned to it all functions which were transferred to PAD during the Korean emergency, but would not be empowered to exercise broad directive powers under the Defense Production Act. Those powers, now held by PAD, would be transferred to the secretary. To enable it to handle its functions competently, the OGD staff would have to be increased. Originally it had only 6 technical members and it is now believed about 20 would be necessary.

It was proposed that if the Government desires industry advice on special oil and gas problems not within the purview of the NPC, MPAB, or FPSC, additional committees should be appointed by the secretary.

Lease legislation . . . Another committee, headed by A. C. Mattei, president of the Honolulu Oil Corp., recommended legislation which would permit the issuance of oil and gas leases on lands covered by unpatented mining claims.

The committee pointed out that conflicts between mining laws dating as far back as 1872 and the Mineral Leasing Act of 1920 obstruct oil and gas development on lands on which mining claims have been asserted on the basis of discoveries of mineral deposits which may be no more valuable than rock, gravel or sand. In enacting the mining laws Congress had in mind that claimants would follow up their finds by applying for patents which would give them outright title to the land, but did not make application mandatory and placed no limit on the time which land might be held under claim.

Since the Interior Department has no record of outstanding unpatented claims, which need only be recorded locally, oil and gas leases have been issued which proved invalid. In some cases oil operators encounter serious difficulties in clearing claims which are held at a "nuisance" value far in excess of their mineral values.

To clear the situation, the committee recommended amendment of the mining laws to expressly exclude from all future mining claims and reserve to the United States the oil and gas.

The committee said the legislation should be implemented by providing for the multiple use and development of the same tract of public land under the Mineral Leasing Act and under the mining laws.

Procedures should be provided under which the owner of any unpatented mining claim on land which is not being worked for the development of valuable mineral deposits may be required to establish the validity of his claim. Failure to do so should free the oil and gas deposits of any rights or interest under the mining laws.

U. S. Fuel Adequate

Resources parley disagrees with Paley group findings

WASHINGTON.—The United States is not in danger of "running out" of oil or other fuels, the mid-century conference on Resources for the Future concluded.

A 3-day discussion of the natural resources position of the country and developments to be anticipated during the next quarter century led to that conclusion in a report by the energy resources section. The report said, "we have abundant energy resources for far more than the next 25 years. Those types of fuels which become exhausted first can be replaced by other types, nuclear energy can be brought in when needed, and still other sources of energy (notably solar energy) lie ahead if we maintain a vigorous program of research."

The findings of the conference were in strong contrast with those of the Paley materials policy commission last year. The Paley survey started on the basis of a mandate to show how resource deficiencies would develop.

No effort was made to estimate what our domestic oil supply would be at any future date but it was suggested that the development of additional fuel sources, especially oil shale, warranted support from the federal Government in the field of research.

Although the conference did not aim at making recommendations for dealing with the problems, there was ample opportunity within the section meetings for debate. Spokesmen for the coal industry made it clear the mine operators will seek legislation from Congress

next year to regulate the end use of natural gas, which they now admit has cut far deeper into coal markets than residual oil imports.

Import policy and development of foreign sources of raw materials supply were hotly debated as was the question of conservation, the latter from the standpoint of methods and policies rather than desirability.

On the basis of this month's discussions Resources for the Future, Inc., which sponsored the meeting, will study the various projects presented and select a limited number to be made the subject of basic studies.

Rate Cut Rejected

FPC holds rapid writeoff no basis for rate slashes

WASHINGTON.—The Federal Power Commission will not make accelerated tax amortization of new natural-gas pipe-line facilities a basis for rate cutting.

By a 4-to-1 vote, with Commissioner Dale E. Doty dissenting, the commission adopted a policy of continuing to relate the annual depreciation charge to the service life of facilities.

The FPC majority took the position that any forced reduction in the rates of companies holding amortization certificates would be inconsistent with the intent of Congress.

While it is clear that Congress did not intend to make gifts to the customers of the companies receiving certificates, the commission said, it is equally clear it did not intend to provide a temporary fund to those companies which could be diverted to the payment of dividends to their shareholders. The opinion declared surpluses for taxes in excess of those actually paid should not be treated as free and unrestricted income, but earmarked to provide for the future meeting of such liability.

The commission held that Congress did not forgive the payment of any income taxes but merely allowed payment to be deferred, and the certificates are comparable to the grant of an interest-free loan by the Government.

The FPC indicated that strong pressure has been brought upon the commission to reduce the rates during the 5-year period of rapid amortization to pass on to consumers the money accumulated by the companies by reason of the deferment of income taxes. It was also argued that some certificates were improvidently issued, but the commission held it had no authority to interfere with the actions of another

WATCHING WASHINGTON

Bertram F. Linz

No Income, No Taxes

More than one-third of American corporations, including some of the largest, have no net income on which they pay federal taxes.

For the oil industry the proportion is somewhat larger, due to something over $1,150,000,000 taken for depletion by oil producing, refining and coal processing corporations.

Internal Revenue Service statistics show that 4,129 corporations engaged in oil and natural-gas production and 662 processors of petroleum and coal filed tax returns for 1950. Balance sheets were filed by 3,704 producers, 1,519 of whom reported no taxable income, and 629 refiners and coal processors, 135 of whom paid no taxes.

The 4,129 producing corporations showed gross sales of $2,551,523,000 and total receipts from all sources of $3,500,126,000. Their deduction for depletion was $388,254,000. The 662 processors reported gross sales of $18,743,915,000 and total receipts of $20,100,177,000, and took $761,816,000 in depletion. The bureau did not show the depletion taken by individuals and unincorporated businesses, but the total allowance for oil and gas is conservatively estimated at something in excess of $1,800,000,000.

Here are some interesting aspects of the corporate picture as a whole: 4,431 of the nation's 765,992 corporations had net income in excess of $1,000,000 in 1950, 522 of them $10,000,000 or more, but 70 others reported deficits of $1,000,000 or more, five of them in excess of $10,000,000.

The 95,494 corporations with net incomes of $25,000 and up paid $16,847,751,000 of the total taxes of $17,316,932,000 paid by 426,283 corporations which had taxable net income. There were 203,031 corporations which reported no net income and 36,678 which were inactive.

Congress Ready for Session

Members of Congress are beginning to drift back to Washington and committees are getting busy, as administration leaders prepare to stick spurs into them to lose no time in getting legislation under way when the session opens next month.

Congress has a big program ahead of it and not too much time if it is to adjourn nearly next summer to permit members to fight out what already promise to be bitter campaigns for reelection.

The oil industry will come in for its share of attention during the session. Right now, imports, the depletion allowance and prices appear to be the major subjects slated for consideration.

It is expected that the Senate banking committee, the Senate interior committee and the Randall Commission on Foreign Economic Policy all will have something to say about oil imports.

The Treasury Department and the House ways and means committee are expected to give consideration to the depletion allowance, possibly with the former urging a cut.

Bureau of Mines Studied

Interior Secretary Douglas McKay is having a study made of the Bureau of Mines to find out what it is doing, how it is doing it and whether it could do it better.

It's part of a department-wide survey initiated by McKay to determine just how the various bureaus are discharging their functions and root out inefficiencies and other shortcomings that may have cropped up during the past few decades.

By the end of next month the committees appointed to make the studies will begin submitting their reports and recommendations to the secretary. The Bureau of Mines' work is being investigated both in Washington and in the field by a 7-man committee from the industries in which the bureau works. J. S. Butler of Houston, Tex., president of the Butler-Johnson Corp., member of the petroleum consulting firm of Butler, Miller and Lentz and vice president of the Independent Petroleum Association of America, is a member of the committee.

One of the problems expected to be laid before the committee by bureau officials is that of recruiting young scientific and technical personnel.

The steadily increasing cost of more complex equipment needed as the oil industry expands, together with the administration's drive for economy have imposed serious handicaps on the bureau's oil studies.

government agency, in this case the Office of Defense Mobilization. It also dismissed the argument that certificate holders will receive an undue advantage because income tax rates probably will be reduced in the future, holding such questions to be outside its jurisdiction.

"The commission is an agency of Congress created to perform certain legislative functions which Congress has delegated to us," the opinion stated. "We have a legal and moral obligation to abide by and execute the laws of Congress. This obligation does not permit us to substitute our judgment for that of the Congress or nullify the clear congressional intent by administrative action."

In his dissenting opinion, Doty charged that commission's decision will require consumers to pay far more than a fair return for utility services, and the companies will secure returns in excess of those necessary to render adequate service and attract capital for proper expansion of facilities.

The majority policy, Doty said, fails to give rate payers any credit for hundreds of millions of dollars many years in advance of the time when such amounts are theoretically due as taxes. He said rate payers in 1954 will be charged for amounts earmarked as income taxes due as late as 1984 or 2004.

Alabama Suit Challenged

WASHINGTON.—The Department of Justice asked the Supreme Court last week to throw out Alabama's suit challenging the validity of the so-called "tidelands" act which returned to the states the submerged oil and gas lands within their historic borders.

The department took the position that Alabama has no standing to sue, that it has failed to state a claim on which relief could be granted and that the United States has not consented to be sued.

Attorney General Herbert Brownell, Jr., told the court that without the consent of the United States the suit cannot be maintained.

Brownell also rejected Alabama's claim that the federal Government has paramount rights in the submerged lands.

"Neither the complaint nor the supporting brief cites any law, constitutional, statutory or decisional, to support Alabama's contention and it is submitted that none can be found," Brownell declared.

The department brief was the last to be filed. The states of California, Florida, Texas and Louisiana submitted theirs a few days earlier. The court is expected in the near future to announce whether it will hear argument before deciding whether Alabama's suit shall stand.

More Synthetic Gas?

Interior official predicts development within decade

PITTSBURGH. — Natural-gas pipe lines traversing areas with large deposits of coal will be transporting high B.t.u. synthesis gas within a decade, Felix Wormser, assistant secretary of the Interior, predicted last week.

Addressing the coal-to-oil advisory group dinner here December 9, Wormser made no attempt to predict when a synthetic liquid fuels industry would be necessary but pointed out that some oil technologists have foreseen a demand for synthetics within the next 12 to 15 years.

Accepting industry opinion that geography will limit the number of plants installed so that not more than about 1,000,000 bbl. per day of shale oil will be produced, Wormser expressed the belief this limitation combined with further reduction in costs makes it probable that manufacture of oil from coal will follow closely that from oil shale.

Wormser told the group that the question as to whether the Bureau of Mines should undertake the large-scale and costly pilot plant investigations "could be more readily and effectively resolved by a larger measure of active participation by industry in cooperative work with the bureau."

Tanker Rates Still Dropping

WASHINGTON. — The Navy has chartered 12 tankers for January voyages at rates ranging from 20 to 21 per cent below the basic Maritime Commission rate for clean vessels and 25 to 31½ per cent below black tanker rates.

The charters included one clean and two black tankers under options of previous Military Sea Transportation Service charters for consecutive voyages, and six clean and three black tankers newly contracted for single voyages.

Customs Service to Collect

WASHINGTON.—For the first time in its history the Customs Service will impose fees on transactions previously provided without cost. The change is in accordance with the administration's plan to make government services to the public pay their own way.

Effective January 8, tanker owners will have to pay a fee of $25 for registration of a house flag or funnel mark. Other fees which may apply to oil movement are $25 for recording a trade-mark, trade name or copyright and $35 for designating a common carrier as a carrier of customs bonded merchandise.

Bureau officials emphasized that the charges will apply only to new transactions and are not retroactive. No charges will be imposed on periodic renewals required by law or customs regulations.

Expansion Forecast Up

WASHINGTON.—Oil refiners will spend at least $689,000,000 on new plant and equipment in the first quarter of 1954, the Department of Commerce predicted last week.

This would be 25 per cent more than the $552,000,000 expended in the first quarter this year and would indicate, if that rate is maintained, that the industry will invest well over $3,000,000,000 on expansion next year.

The department estimated that the 1953 expansion is costing the industry approximately $2,778,000,000. The first quarter normally is one of minimum expansion by industry generally, with expenditures rising in the second quarter, dropping back in the third and jumping to the high for the year in the final 3 months.

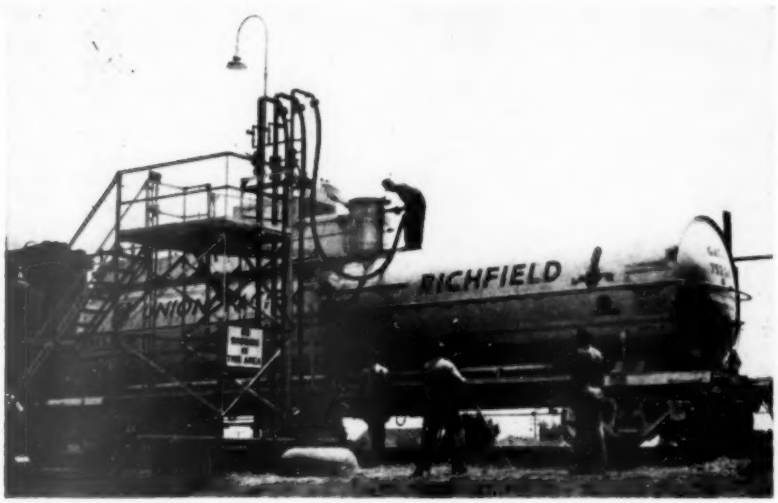
Department surveys indicate that the oil industry, after starting off in the first quarter this year with expenditures of $552,000,000, increased them to $724,000,000 in the second quarter, with a drop to $711,000,0 in the third quarter and a jump to $790,000,000 in the current period.

Tanker Firm Indicted

WASHINGTON.—A Federal grand jury here has indicted the Philadelphia Marine Corp., New York, on charges of false statement in connection with assumption of a mortgage on one of the government's surplus T-2 tankers.

The indictment charges the corporation made false statements and representations in an application filed December 5, 1950, with the Maritime Administration for authority to assume a $1,032,640 mortgage on the SS Captain John D. P. It is alleged the application stated the citizenship of the corporation to be United States when in fact it was under control of a Greek subject, Manuel E. Kulukundis of New York.

The application stated that 75 per cent of the voting power of the corporation was vested in United States citizens, but the government charges that only 39 per cent was so vested.



PROPANE TENDER, towed by gas turbine-electric locomotive, is refueled at Union Pacific Railroad's East Los Angeles terminal.

New Locomotive Fuel

First test runs of propane-powered turbine-electric unit indicate high operating efficiency, low maintenance cost

D. H. Stormont

LOS ANGELES.—More than 50,000 miles operation with the world's first propane gas-operated turbine-electric locomotive has proved propane to be an ideal fuel from the combustion viewpoint.

No conclusions have been reached as to whether propane will be the railroad's fuel of the future . . . say 20 years from now . . . but initial performance tests have confirmed its clean-burning properties make for sustained high operating efficiency with low maintenance costs.

Performance of propane in this new use was extensively discussed by three speakers at the late November meeting of the Los Angeles A.S.M.E. gas-turbine power division. Representing the three companies engaged in the experimental work, were L. J. Grunder of Richfield Oil Corp.; Ross Hill of Union Pacific Railroad Co.; and R. J. Hamilton of General Electric Co.

The more extensive experience with Bunker C type fuels also was brought out. Union Pacific now has eight gas-turbine locomotives using this fuel in regular freight service between Green River, Wyo., and Odgen, Utah. These have consumed more than 16,000,000 gal. of residual fuel to date and are averaging better than 80 per cent availability.

Still another locomotive is operating on distillate-type fuel which, during last summer, did not require use of a steam boiler to provide heat for the fuel. A total of 10 turbine-electric units are being used by Union Pacific. In February the first of an additional 15 will be delivered.

These 5,000-hp. General Electric units have eight electric-motor-powered axles. Electricity is supplied by a gas-turbine-driven generator. The single unit produces more power than three diesel units operating together. Conversion of a turbine from heavy fuel to propane is readily accomplished through installation of available control devices.

As pointed out by Grunder, the conversion to gas-turbine locomotives is only part of a national search by railroad companies for a fuel less costly than the diesel oil being consumed in diesel locomotives. The switch will be years in coming, he indicated, because:

"The railroad diesel came into existence during a time when diesel fuel cost less than 4 cents per gallon, or $1.68 per barrel at the highest. The transition from steam engines to diesel was a lengthy, painful period of experimentation: the day of the steam engine is just now approaching its end—some 20 years later."

Low-gravity fuels . . . First regular-service gas-turbine locomotives using residual fuel was placed in operation in January 1952. A year later six such locomotives had a cumulative mileage of more than 437,000 miles.

Currently, each of eight units is running about 9,500 miles monthly, with fuel consumption averaging about 14.85 gal. per mile. Of this, 14 gal. is heavy fuel and the remainder is diesel oil for the auxiliary diesel engine. Cost of the fuel for the turbine locomotives is comparable with diesel engines on a 1,000 gross ton-mile basis and considerably less than for steam locomotives.

Because of ash deposits and corrosion in the combustion tubes and on the turbine blades, the low-gravity fuel turbines at first required inspections every 100 miles. Often 60 hours were required for making repairs and parts replacement. The units today are inspected after 200 hours' operation, but only about 2 hours are required for inspection and replacement of parts.

Greatest contribution to improved performance of these turbines was the finding that vanadium and sodium-sulfur compounds were highly corrosive at the elevated temperatures which exist in the combustion and turbine sections. This was partially overcome by using a fuel containing a soluble additive which establishes a ratio of calcium to vanadium and sodium to vanadium. Use of magnesium in place of calcium is proving an even better antidote, Grunder declared.

Performance of propane . . . Corrosive properties of the Bunker C type fuels led to the consideration of a gaseous fuel. For, as Grunder pointed out, "Why not start with a clean combustible gas, if liquid and solid fuels have to be converted to gas before they can be burned?" Propane, which "is certain to be available for a long time to come, and the cost of which will generally follow crude prices," thus was decided upon.

The propane gas-turbine locomotive made its trial run last May 29 and since then has been in regular freight service between Los Angeles and Las Vegas, Nev. No data as to its fuel consumption and operating economy were presented, but Hill stated that while operating from 9,500 to 9,800 miles monthly its operational availability was very close to that of a diesel locomotive.

Compared with the residual-fuel tur-

bine locomotives, propane was said to insure high turbine efficiency and freedom from deposit and corrosion problems. Modern loading facilities constructed at Los Angeles and Las Vegas enable the towed propane tender to be filled in less than 30 minutes.

A standard 12,500-gal. L.P.G. tank car was adapted for use as the fuel tender, with the regular 7,200-gal. fuel tank being filled with water to insure constant weight and traction. Propane vaporization is accomplished by means of two fin-tube heat exchangers, heated by a 200-psi. steam boiler at the rear of the locomotive. Automatic maintenance of a 94°-95° F. temperature on the liquid propane results in a rate of vaporization of 900 to 1,300 gal. per hour at a pressure of about 150-psi. gage.

Union Lets Contract

Unifiner scheduled for completion late in 1954

LOS ANGELES.—Contract for a 15,750-bbl. Unifiner at its Oleum refinery has been let by Union Oil Co. to C. F. Braun & Co.

Construction will begin early next year and is scheduled for completion a year from now. Bechtel Corp. was awarded contract for the auxiliary facilities, tankage, and lines.

The new plant will be the first commercial application of the company's cobalt molybdate catalyst process for upgrading high-sulfur distillate stocks. Feed stock will be a 45° gravity, 1.8 per cent sulfur gasoline. The essentially sulfur-free product then will be processed in a 12,500-bbl. Platformer to produce 95-100 octane leaded gasoline. The latter will supply the hydrogen for converting the organically combined sulfur in the feed stock to hydrogen sulfide.

Feed stocks initially will be a blend of straightrun gasoline and coker distillate from existing Oleum units. When the planned 20,000-bbl. coking plant is completed, probably in the Santa Maria area, light products from this operation will be processed in the Unifiner. A sulfur recovery unit also is planned for stripping hydrogen sulfide from the waste gases.

New process . . . In discussing the new process, Fred L. Hartley, manager of Union's new Commercial Development Division, pointed out that the traditional method of removing sulfur by sulfuric acid extraction is costly and entails a considerable loss of volume.

"With the advent of the Unifiner, industry is in a position to increase the production of gasoline from high-sulfur, high-nitrogen crude distillates because this new process removes essentially all the sulfur and nitrogen as hydrogen sulfide (for subsequent sulfur production) and ammonia, respectively. There is no loss of yield in the process."

The process, which will be licensed by Union, also is applicable to the treatment of poor quality gasolines, diesel oil, and the preparation of heavier gas-oil fractions for subsequent catalytic cracking, Hartley declared.

Deepest Pay Found

Richfield tests condensate flow at 17,500-17,895 ft.

BAKERSFIELD, Calif.—The world's deepest production has been found in North Coles Levee field only 10 miles from the deepest well ever drilled.

Richfield Oil Corp.'s 67-29 C.L.A. flowed condensate last week from an Eocene sand at 17,500-17,895 ft. Previous deepest production was found at 17,260-17,306 ft. in Shell Oil Co.'s 2 Gonsoulin - Minville in Weeks Island field of coastal Louisiana.

It is generally believed, however, that the Richfield well will prove uneconomic. During initial production tests December 4, the well flowed a net of 119 bbl. of 43° - gravity condensate through an 18/64-in. choke. On December 7, the flow dropped to 68 bbl. of 57°-gravity condensate through a 16/64-in. choke, with a 16.5 per cent water cut. Gas production during the latter test was 1,565 M.c.f., and tubing pressure was 1,500 psi.

Significance . . . Principal significance of the deep test is that it established Eocene production in the south central portion of the San Joaquin Valley. The pay is found at 10,000 ft. at Wheeler Ridge, about 25 miles southeast, and at still shallower depths in the McKittrick area, 20 miles west.

Eocene rocks were the objective of Ohio Oil Co.'s deep test in Paloma field, the world's depth record holder. It is believed to have failed to find them in drilling to 21,482 ft. Last week Ohio still was fishing for stuck washover pipe at about 12,000 ft., approximate top of the 4½-in. drill pipe also stuck in the hole.

Call for Bids Imminent

LONG BEACH, Calif.—The Long Beach City Council has asked City Atty. Irving Smith to prepare new contracts for development of parcels K and L of the city's Wilmington oil properties.

The action was taken after a hearing on numerous proposed changes in existing contracts. Frank Hardesty, chief petroleum engineer for the Harbor Department, suggested 15 changes, 11 of which the board accepted.

Parcels K and L, for which development bids are to be asked soon, lie immediately south of proved production. Parcel K includes 875 acres south of Piers A, B, C, D, and E. Parcel L, containing 550 acres, is southeast of Pier A.

One of the accepted changes provided that the contracts for the two parcels would terminate in 11 years on the same date as those of Richfield Oil Corp. and Long Beach Oil Development Co.

California Production Up

LOS ANGELES. — After declining from the all-time production peak of 1,011,300 bbl. daily established last June, California oil production is again climbing. Output during November was placed at 1,010,700 bbl. in a preliminary report, up almost 10,000 bbl. from the October daily average.

Ventura Avenue field was the largest contributor, with an increase of 4,000 bbl. to 90,400 bbl. daily. Minor raises in the San Joaquin Valley and Los Angeles Basin fields accounted for the remainder.

ROCKY MOUNTAIN

North Dakota Adopts Rules

BISMARCK, N. D.—A new set of regulations for conservation of oil and natural gas has been put into effect by North Dakota following approval by the State Industrial Commission.

The rules, formulated by Dr. Wilson M. Laird, state geologist, provide for automatic hearings before the industrial commission or its representative within 15 days after completion of a discovery well to determine temporary spacing of wells for the new pool.

Permits cannot be issued for a direct 40-acre offset to the discovery well between the discovery and the first hearing. This allows 80-acre well spacing to be required when the commission deems it necessary. A second hearing will be held within 18 months to determine spacing requirements for the pool on the basis of drilling and production records.

Oil production allowables will be fixed on a 40-acre basis, although that allowable may vary between pools. The first production proration hearing is set for December 15.

Gas Deadlock Prolonged

Alberta passes buck to federal transport board to decide who shall export gas, suggests merger of opposing plans

EDMONTON, Alta. — The Alberta Petroleum and Natural Gas Conservation Board, after months of long and expensive hearings on the gas-export question, has turned the whole matter over to federal authorities—still with no definite decision as to who will build the transmission system.

Alberta Premier E. C. Manning, who made public the conservation board's report, said that neither Trans Canada Pipe Lines, Ltd., or Western Pipe Lines, Ltd., had established an assured market which would provide volumes and prices to Alberta producers and successful financing of the respective lines.

Manning said, however, that he favors export both to Eastern Canada (Trans Canada) and to the Minneapolis area of the United States (Western). The applicants, he said, will be called before the federal Board of Transport Commissioners about January 1 in Ottawa to see if the competing companies will merge their proposals for exporting Alberta gas.

The provincial government believes, Manning said, that "the interests of producers, consumers, and Canada as a nation can best be served by Trans Canada Pipe Lines and Western Pipe Lines combining into one project the major proposals of their respective applications—that is to say, the construction of an all-Canadian pipe line from southern Alberta through Regina and Winnipeg to the markets of Ontario and Quebec with a connecting line running south from Winnipeg to the Minneapolis market areas of the United States."

The cost of such a system has been estimated at about $330,000,000. The board also recommended an internal trunk-line gathering system under exclusive provincial jurisdiction and control. The gathering system, which would be operated as a common carrier, would take the gas to a designated border point for export. Such a system, Manning said, together with exploration and development, would cost another $200,000,000.

Gas reserve . . . The conservation board found that Alberta's proved gas reserves was 11.5 trillion cubic feet as of June 30, 1953. This is an increase of 4.7 trillion cubic feet since the board's report of March 1952. The board said Alberta may anticipate further increases in proved reserves of from 1¾ to 1½ trillion cubic feet annually for the next 10 years.

Of the 11.5 trillion cubic feet, Manning said, roughly 3½ trillion cubic feet of deliverable surplus gas is available for export to the east and this volume will increase to about 5 trillion cubic feet by the time a pipe line can be completed, provided the incentives necessary to stimulate continued development are maintained.

Export to Montana . . . The board also recommended that a permit be granted for Canadian-Montana Pipeline Co. to export all gas from the Pakowki Lake producing area in southeastern Alberta to Montana. A 5-year permit for the company to pipe gas to Montana Power Co. for delivery to Anaconda Copper Mining Co. on defense grounds was granted in 1950. Under the recommended permit, gas would be exported for 21 years and used as the importers saw fit. This proposal would require an export permit from the federal Government and an import permit from the U. S. Federal Power Commission. Some observers here believe the government's ruling here would be an indication of how it feels about export to Minneapolis. Alberta, Manning said, has a surplus reserve of about 334 billion cubic feet in the Pakowki Lake area.

Reaction to report . . . Gas men here are generally happy about the board's decision. Most in Edmonton are supporters of Western Pipe Lines who long have claimed the American market is essential to the successful financial operation of a gas line from Alberta.

The feeling is that with the proposed merger scheme there still is room for Tennessee Gas Transmission Co. gas to go to Consumers' Gas Co. from Buffalo for delivery in the Toronto area. By the time the Toronto area market has been built up, it is said, Tennessee would be glad to accept Alberta gas.

It is not believed here the FPC would receive many objections to Alberta gas going to the Minneapolis area and that

Oklahoma's New Geologic Map Nears Completion

Nearly 6 years of work on the first geologic map of Oklahoma since 1926 is nearing an end for Dr. Hugh D. Miser, U. S. Geological Survey. Copies of the 24-color map will be printed by late 1954. Miser is shown holding black-and-white proof of the forthcoming map which contains about 80 per cent new information. The manuscript map hangs behind Miser in the offices of the Oklahoma Geological Survey on the University of Oklahoma campus.

Northern Natural Gas Co. would welcome the Canadian gas.

Expanded Refinery Operating

IOCO, B. C.—Imperial Oil Co.'s newly expanded refinery, the largest in the Pacific Northwest and the first in British Columbia to have a fluid catalytic cracking unit, is now in operation.

The refinery is supplied from the Alberta fields by the recently completed Trans Mountain pipe line. This will be the first plant in the province to process only Canadian crude oil. Imperial began special rail shipments of crude oil from Alberta in the fall of 1952, receiving an average of 5,000 bbl. daily. Rail shipments continued until pipe-line deliveries began.

The construction program at the Ioco refinery involved expenditure of more than $13,000,000 and expansion of crude-oil throughput capacity from 12,000 bbl. per day to 22,500 bbl. daily.

The Ioco cat cracker has a capacity of 7,600 bbl. per day and is a Model IV fluid unit licensed by Standard Oil Development Co. This was incorrectly termed in a previous issue of the Journal an Orthoflow unit (M. W. Kellogg Co. license).

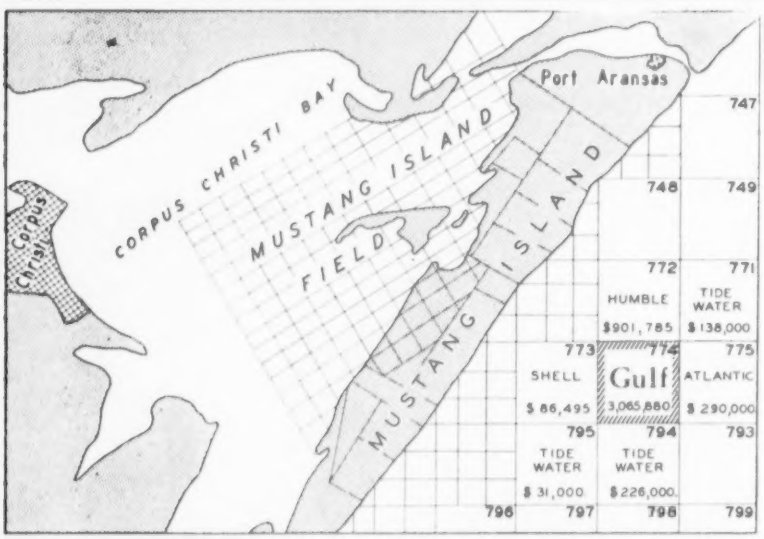
Additive Plant on Stream

VILLE LaSALLE, Que.—Monsanto Canada, Ltd., has completed construction and started production of oil additives at its new $400,000 plant here.

The plant is manufatcuring detergents, inhibitor additives, and compounds for lubricants. Production was started earlier of a new industrial tape made from vinyl film at Barrington Rubber & Plastics, Ltd., a Monsanto Canada subsidiary in Oakville, Ont.

The crankcase additives produced at Ville LaSalle are the first entirely manufactured in Canada.

GULF COAST



Big Bid Hints at New Structure

HOUSTON.—Strong indication that Gulf Oil Corp. has found a promising new structure in submerged lands off Nueces County, Texas, lies in the company's huge $3,065,880 payment to the state December 1 for a 5-year lease on 5,760-acre Block 774.

The northwestern corner of the block is about 5 miles seaward from the southeast beach of Mustang Island. (See map.) Though the acreage is only about 6 miles from prolific multizone production in Mustang Island oil and gas-distillate field, it is considered highly improbable that Gulf will extend this production.

Subsurface mapping of Mustang Island field indicates that the field is a closed structure developed on the upthrown side of a down-to-the-coast fault running in a general northeast-southwest direction along the axis of Mustang Island. Production, in the Frio sand series (Oligocene), extends from this fault northwestward into the shallow waters of Corpus Christi Bay.

What is much more likely, observers say, is that Gulf has found a new structure probably akin to the Mustang Island fault during its extensive geophysical work in the area. Considerable weight is lent to this theory in that Block 773, directly west of 774 and considerably closer to Mustang Island production, went to Shell Oil Co. for a relatively meager $86,495.

Gulf not talking . . . Gulf is silent regarding its reasons for wanting this particular piece of acreage—one official saying only that "we knew we wanted Tract 774 and we made sure we got it." Next highest to Gulf's bid for the tract was the $1,008,000 offered jointly by Atlantic Refining Co., Tide Water Associated Oil Co., Cities Service Oil Co., and Continental Oil Co.

Tract 774 extends from about 5 miles off Mustang Island at the nearest point to about 8½ miles into the Gulf of Mexico. Depth of the water ranges roughly between 30 and 40 ft. Gulf indicates it will be well into next year before drilling will be undertaken and that it has not yet decided definitely how it will drill in water this deep.

SOUTHWEST

Flood Permit Sought

AUSTIN.—Magnolia Petroleum Co. is seeking permission of the Texas Railroad Commission to water flood the 1,700-ft. Cisco sand underlying seven leases totaling roughly 300 acres in Wichita County Regular field, Wichita County.

Testifying at a commission hearing early this month, J. W. Whitney of Magnolia, said the company expects to recover from 1 to 3 million barrels of additional oil by means of the flood project. Original oil in place was estimated at from 4 to 10 million barrels.

Magnolia plans to convert 11 of the 22 producing wells on the leases to injection service, Whitney said. The company will drill 16 adidtional injection wells and 15 additional producers. Plans call for injection of about 140 bbl. of water per day per well under a maximum pressure of 700 psi. through a closed system.

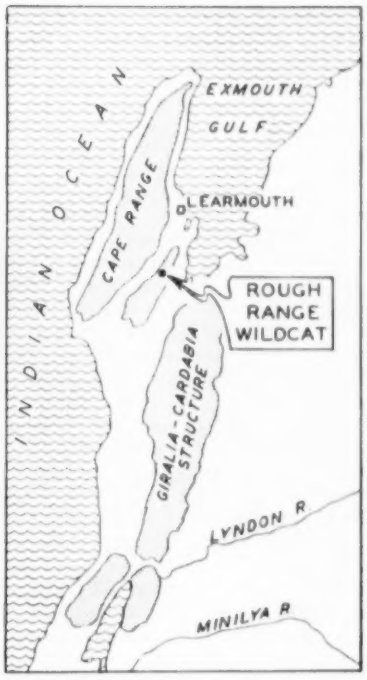
Production of the leases currently averages about 1 bbl. of oil per day per well.

New Mexico Sets Land Sale

SANTA FE.—Public offering of 44 tracts of New Mexico state lands will be held here December 15.

Acreage in 35 tracts will be handled by sealed bids and the remaining 19 tracts will be offered for oral bidding. The sale will take place in Capitol Annex Building.

EXPLORATION PARTIES such as this one preceded by more than 2 years the location and drilling of the Rough Range discovery well by West Australian Petroleum, Pty., Ltd. The geological survey group shown here is in the Fitzroy River region of the Kimberley Division, another part of the concession area about 750 miles northeast of the Rough Range wildcat.



AUSTRALIA

Wildcat Is Producer

West Australian Petroleum keeps drilling after hitting 550-bbl. daily pay at 3,600 ft. in Rough Range wildcat

Dahl M. Duff

LIGHT oil flowing at a rate of better than 550 bbl. daily has been obtained by a Caltex-controlled company in a rank wildcat about 600 miles north of Perth in Western Australia.

The discovery, which promises to establish the first commercial production in the entire continent of Australia, was the first well drilled by West Australian Petroleum Pty., Ltd. (WAPET), owned 80 per cent by California Texas Corp. and 20 per cent by Ampol Petroleum, Ltd., an Australian marketing and importing company.

The excitement in Australia over the discovery was illustrated in the reaction of the Ampol company's stock. Its rise was the sharpest in the history of the Sydney exchange. The 10s (Australian) shares soared more than 32 to 50s in Sydney, and in Adelaide, to 70s.

W. G. Walkley, Ampol's managing director, said the crude was a high-quality, paraffin-base type and that the discovery was probably "the biggest thing in Australia in years."

On a drill-stem test at 3,605-3,620 ft., the well, Rough Range 1, flowed waxy crude at a rate of 23 bbl. per hour for 25 hours through a ¼-in. bottom-hole choke. An earlier test of several hours flowed 20 bbl. an hour through the same size choke with gravity of the crude of 39.6° A.P.I. Later determinations showed the gravity may run as high as 43°-44° A.P.I. Age of the producing sand was not definitely known.

The company announced it had completed its testing program at the discovery depth and resumed drilling in accordance with the original plans for a deep hole to evaluate thoroughly the prospects of the area. Latest reports were that the well was drilling ahead at 3,919 ft. after setting 13⅜-in. casing at 3,862 ft. A National 130 rig capable of depths in the 16,000-ft. range is being used with the drilling under contract to Brown Drilling Co., Long Beach, Calif.

Structure . . . The Rough Range structure on which the well is located is a surface feature which was mapped at depth by seismograph. The well itself is close to Exmouth Gulf and about 15 miles south of Learmouth. The region is desolate bush country containing widely separated sheep ranches.

The discovery provides the industry with another example of successful oil exploration in an area which had been examined and rejected by various companies in the past. Rough Range, the much-larger 60-mile-long Cape Range structure on the peninsula separating Exmouth Gulf from the Indian Ocean, and other surface-apparent features in the 45,000-sq. mile North-West Basin of Western Australia have been long known to exist but general geological opinion was that they were unlikely prospects.

Ampol acquired exploration rights over a large part of Western Australia in 1947 and in May 1951 reached an agreement with Caltex setting up the operating company and providing financing for the program. Earlier efforts to find oil in Western Australia date back to 1920. Richfield Oil Corp. was formerly interested with Ampol in the North-West Basin but withdrew in 1949.

Prewar exploration in Western Australia was mostly centered in the larger Desert Basin some 800 miles northeast of the Exmouth Gulf area. Caltex itself did geological work in the Desert Basin before the war but withdrew in 1943. A few shallow exploratory wells have been drilled in the Desert Basin

but none in the North-West Basin before the current Rough Range well.

West Australian Petroleum holds concessions from the West Australian Government covering approximately 340,000 sq. miles and extending along the western and northern coasts and inland to include the Desert Basin. Virtually all the state's sedimentary acres are included in its holdings.

Exploration boost . . . The discovery will give impetus to an exploration program which previously was projected as a long-range effort. Since 1951, approximately $5,000,000 has been spent. The rig used at Rough Range was shipped from California and lightered ashore at Rough Range. The wildcat itself had been estimated to cost $2,500,000 *(The Oil and Gas Journal, November 16, page 192).*

In the 45,000-sq. mile North-West Basin, detailed geological surveys of three separate structures were made earlier by the Australian Bureau of Mineral Resources. The rugged and broken Cape Range proved difficult for seismograph operations, and the Giralia-Cardabia structure was found not to continue at depth. Rough Range was first indicated by the bureau which ran an east-west traverse from the Giralia region to Cape Range, and in 1952 and early this year, West Australian Petroleum carried a second traverse to pinpoint the location.

Throughout Australia itself, oil exploration has been conducted with varying degrees of intensity for the last half century and in eastern Australia has been marked by several major failures. Two years ago, Shell abandoned a program after a deep well in Queensland, and in 1949 a joint program by Anglo-Iranian Oil Co., Ltd., Standard-Vacuum Oil Co., and the Zinc Corp. was discontinued.

Caltex carries out integrated operations in the Eastern Hemisphere except for West Africa. Its exploratory work is directed through American Overseas Petroleum, Ltd., also owned by Standard Oil Co. of California and The Texas Co. Caltex's present crude supply is from the parent companies' 60 per cent share of Saudi Arabia's output, about 30,000 bbl. daily in Bahrein, and around 50,000 bbl. daily from Central Sumatra. Caltex has a 22,000-bbl. daily refinery under construction near Sydney, one of four refinery projects now under way in Australia where consumption, including bunkers, is in excess of 100,000 bbl. daily.

Sumatra Plant Produces Avgas Alkylate

Since the shutdown at Abadan, virtually the only facilities in the Eastern Hemisphere for the production of aviation gasoline, outside Russia and its satellites, have been those in South Sumatra in Indonesia. Shown here are the storage tanks for the alkylation plant at Standard-Vacuum's Sungei Gerong refinery, seen across the top of the feed drum for the stabilizing unit. Vacuum pipe stills are at top right. The 64,000-bbl.-daily Sungei Gerong refinery ranks as the second largest in eastern Asia, after the nearby Pladju refinery of Shell. (A Standard-Vacuum photo.)

MIDDLE EAST

Oil Talks to Resume

Resumption of Iranian-British diplomatic relations is important preliminary step toward settlement of dispute

AN important preliminary step to eventual settlement of the Iranian oil dispute was taken last week when Britain and Iran agreed to a resumption of diplomatic relations.

Efforts to end the long-standing deadlock resulting from the 1951 nationalization of the properties of Anglo-Iranian Oil Co., Ltd., are now expected to advance to the stage of formal negotiations.

During the last 2 months, groundwork for the settlement negotiations has been laid by Herbert Hoover, Jr. As a special representative of the Secretary of State Dulles, Hoover has been meeting successively with officials in Teheran and London to sound out their views.

Loy Henderson, U. S. ambassador to Iran, left Teheran early last week to meet Vice President Nixon who will return with him to the Iranian capital. Nixon is expected to throw his influence behind the current efforts for a settlement.

In both London and Teheran, officials were expressing confidence that the differences over the oil issue can now be resolved. A British Government communique said, following an exchange of ambassadors, the two countries "will proceed at the earliest mutually agreed moment to negotiate a settlement of the oil dispute which has recently clouded relations."

Opposition . . . The agreement to resume diplomatic relations met some opposition in Iran, but the government of Prime Minister Zahedi was not seriously challenged. An attempted demonstration in the bazaar was quelled by several truckloads of soldiers. Although the news was generally received quietly, the government's action has been denounced by Hussein Makki, former lieutenant of the now-jailed Prime Minister Mossadegh, and the religious leader and fanatical nationalist, Mullah Kashani.

There was ample evidence of an increasingly conciliatory attitude toward Britain. Several Iranian newspapers published long articles reviewing the history of British-Iranian relations and pointing out that Britain had on several occasions acted to preserve the country's independence. Prime Minis-

ter Zahedi met with a large group of Iranian political and business leaders before deciding to resume British diplomatic relations and received support for the move.

Compensation arbitration . . . Prospects for an oil settlement appear to hinge largely on the acceptance by Iran of arbitration of the issue of compensation by an international agency, such as the International Court of Justice. This all along has been a minimum stipulation of the British who are prepared to recognize the nationalization but on the condition that Iran make satisfactory arrangements to pay for the properties.

In addition to this problem, there also remains to be decided the method by which Iranian oil will be handled in world markets. A group of American and British international oil companies to handle distribution is under consideration. Involved in this are a number of delicate questions, such as price, division of profits, and possible production cutbacks in other countries to make way for the re-entrance of Iran's output. In Britain, several influential publications have recently urged their government to make sure that Iranian oil does not finally end up under the domination of the large American oil companies.

EUROPE

FIRST OF ITS KIND in the world, this Thermofor continuous percolation unit at the new Coryton refinery of Vacuum Oil Co., Ltd., in England, employs the process in the final stage of the manufacture of lubricating-oil stocks.

Refinery Complete

New facilities round out British building program

COMPLETION of additional facilities since the main plant was brought on stream last January has rounded out the construction program of Vacuum Oil Co., Ltd., at its Coryton refinery on the Thames Estuary in England.

Now approaching completion are the lubricating-oil processing units, propane deasphalting plant, and the MEK dewaxing installation. Early in October, the Thermofor continuous percolation unit, the first plant of its type to be built, was brought into operation.

The Thermofor catalytic cracking unit was recently finished. In this airlift unit, the 30 to 50 tons of catalyst moves continuously at an estimated circulation of 280 tons per hour, or approximately seven changes per hour.

The refinery was placed in initial operation in January when the No. 1 boiler was fired. Subsequently temporary offices and workshops have been replaced by permanent buildings, a research and testing laboratory set up, and roads and a railroad line built. The work moved ahead despite floods last spring which inundated the site and halted production for 21 days.

In April and June, the No. 2 and 3 boilers were started up, and a short time later, the atmospheric side of the distillation unit, the thermal reformer, the gasoline-treating unit, and the ethyl blending plant were completed. The furfural unit came on stream at the beginning of August.

The now virtually completed refinery cost approximately $33,600,000. About 95 per cent of the equipment was supplied from British manufacturers. The refinery, though providing a full line of products, was primarily designed for the production of lubricating oil. The Vacuum company is owned equally by the Powell Duffryn interests in Britain and Socony-Vacuum Oil Co., Inc.

Soviet Reveals Austria Plans

The Russian oil administration is again meeting virtually all Austria's internal requirements for products in 1954.

SMV, the Soviet distributing agency, has told Austrian authorities it will deliver a total of 1,009,500 tons (about 20,000 bbl. daily) of products to Austrian markets next year. This will include 150,000 tons of gasoline, 8,500 tons of special naphtha; 26,000 tons of paraffin, 190,000 tons of gas oil, 550,000 tons of fuel oil, 55,000 tons of special oils, and 30,000 tons of asphalt.

The amount the Soviets are releasing on the Austrian market represents roughly a third of the total crude-oil production which they control in their zone. The remainder is exported to the Communist satellite countries, mostly in the form of crude oil.

International Briefs

What is reported to be the best producer developed in recent years in Camiri field in Bolivia has been completed by Yacimientos Petroliferos Fiscales Bolivianos. The well, C-49, had an initial production estimated at 75 cu. m. (about 475 bbl. daily), according to information from La Paz. Camiri, in the southwestern part of the country, furnishes most of the present 1,600 bbl. daily production of the government oil organization.

Further testing of the Shell-D'Arcy Akata well in eastern Nigeria has confirmed the presence of oil in small quantities associated with a considerable volume of gas. A company announcement in London said that although the results are encouraging, the tests have not so far established the existence of oil in commercial volume. The well is in Calabar Province about 50 miles east of Port Harcourt. The discovery is the first definite result of an exploratory program that began in 1937 with preliminary surveys. Shell-D'Arcy Petroleum Co. of Nigeria, Ltd., is a 50-50 affiliate of Anglo-Iranian Oil Co., Ltd., and Royal Dutch-Shell.

Pipe-Line Veteran

Boyhood job started Paine on road to top Socal post

ENGINEERS who know their way around in industry will tell you that a good engineer is born, not made. And a career such as Ralph K. Paine's bears them out.

From all indications, the veteran manager of Standard Oil Co. of California's pipe-line department was a born engineer, despite the fact there wasn't a trace of engineering heredity on his family tree.

Paine earned his first spare-time dollars while still in grammar school as a chainman on a surveying party. By the time he was in high school, the neophyte engineer was running his own party and laying aside money to finance a college education.

Born in Albany, N. Y., Paine moved to southern California with his parents as a boy and attended high school in Glendale before the family moved north to Berkeley, where he earned his high school diploma.

Paine matriculated at the University of California in 1918, majoring in civil engineering and taking a heavy program during the regular school year in order to have the time to work his way through with summer jobs.

Too busy with classes to be much of a campus celebrity, Paine none the less left his mark as the man who ran a preliminary survey for construction of mammoth Memorial Stadium, home of the university's football squad.

His summer assignments also included laying out street curbs and paving grades for the city engineer of nearby Martinez, Calif., and a stint with Standard Oil Co. of California's engineering department in 1920.

Socal career . . . Paine first went on the California Standard payroll permanently in 1922, immediately after graduating with a B.S. degree. Starting out as a junior engineer, he moved steadily upward through the management echelons, and was instrumental in the construction of some of Standard's major pipe-line projects.

Other major way-points in his career include operating superintendent for the pipe-line department in the Kettleman-Coalinga area (1936); assistant superintendent for the Midway-Kettleman-Coalinga area (1937); and superintendent of that area (1938).

In 1940, Paine was called back to the home office in San Francisco as a staff assistant in the pipe-line department. Two years later he was named superintendent of transportation, and in 1946 he was promoted to general superintendent of the department's southern (California) district. He was named head of the pipe-line department on July 1, 1949.

Outdoorsman . . . Paine still has the same enthusiasm for the outdoor life that he had as a youth working on survey jobs.

Tanned, husky, and fit at 54, he likes nothing better than a trout-fishing vacation in California's High Sierras. In between times, he makes five or six trips a year on the party boats which take local salmon anglers out past the famed Golden Gate. His biggest salmon catch to date has been a thirty pounder.

Paine also is something of an amateur lapidary and wears a tie-clasp mounted with obsidian he ground and polished in his own basement workshop. This avocation he owes to his wife, who introduced the hobby into the Paine family.

Alfred H. Curry, formerly district production foreman of Shell Oil Co.'s South Mountain field near Santa Paula, Calif., has been transferred to Denver as division production superintendent of Shell's new exploration and production area. **Watson W. Lupton** has replaced Curry, and **O. H. Niemela** has taken Lupton's place as Ventura district production foreman. **George W. Mikuls** has been promoted from production foreman to district production foreman at Ventura.

Rex E. Cheek and **Taber de Polo** have joined the consulting firm of Ball Associates in Washington, D. C., recently formed by **Max W. Ball** and **Douglas Ball.** Cheek formerly was with Stanolind Oil & Gas Co., and de Polo had been an independent contractor.

Preston Welch, driller with Joe Dixon Drilling Co., has been transferred from Big Spring, Tex., to McAllen.

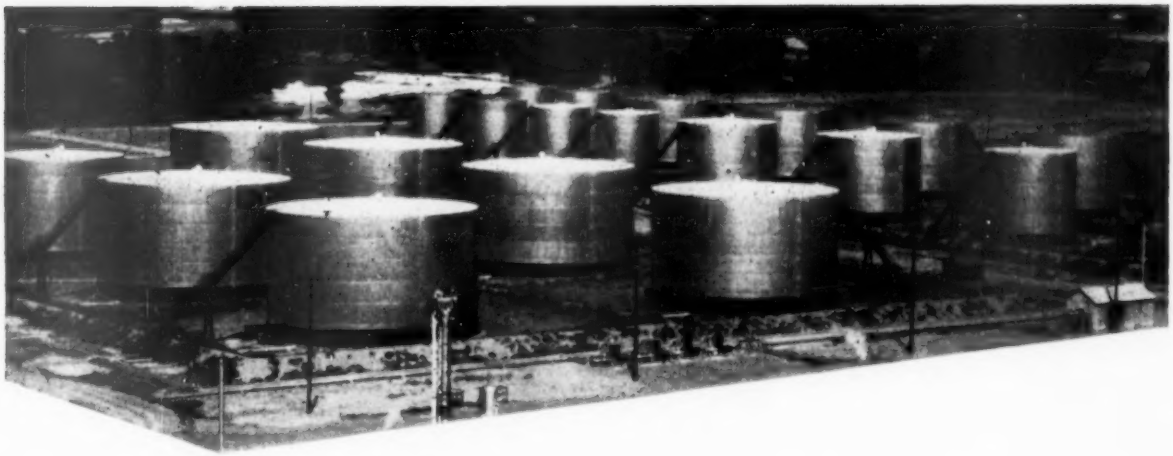
DR. WESCOTT

Dr. Blaine B. Wescott has been appointed director of research and executive vice president of Gulf Research & Development Co., effective January 1. He will replace **Dr. Paul D. Foote,** retired, who joined Gulf in 1927 and was made director of research and executive vice president of Gulf Research when it was established in 1933. Dr. Wescott, with Gulf since 1927 and associate director of research for Gulf Research since 1951, also has been elected to the board of directors. **Dr. E. A. Eckhardt,** vice president of Gulf Research and associate director of research, also will retire December 31, and **Dr. Leo J. Peters** and **Dr. Jerry McAfee** have been named associate directors of research and vice presidents. Dr. Eckhardt joined Gulf Production Co. in 1928, was appointed assistant director of Gulf Research in 1933, and made vice president in 1941. Dr. Peters was formerly director of geophysical operations and an assistant director of research and has been associated with Gulf since 1929. Dr. McAfee joined Gulf in 1945 and was named assistant director of research in December 1951, with responsibility for all product and process work.

DR. PETERS

DR. McAFEE

Creole Petroleum Corp. has appointed an executive committee which will act when the board of directors is not in session. The new committee, which



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Birmingham, 1	1536 North 50th St.	Havana	402 Abreu Bldg.	Pittsburgh, 19	3228 Alcoa Bldg.
Boston, 10	1025-201 Devonshire St.	Houston, 2	2119 C & I Life Bldg.	San Francisco, 4	1554-200 Bush St.
Chicago, 4	2128 McCormick Bldg.	Los Angeles, 17	1523 General Petroleum Bldg.	Seattle, 1	1325 Henry Bldg.
Cleveland, 15	2204 Midland Bldg.	New York, 6	3347-165 Broadway Bldg.	Tulsa, 3	1308 Hunt Bldg.

REPRESENTATIVES AND LICENSEES

Horton Steel Works Limited, Fort Erie, Ontario, Canada
Ateliers et Chantiers de la Seine Maritime, Paris, France
Constructions Metalliques de Provence, Arles-sur-Rhone, France
Chicago Bridge & Iron Company, Ltd., Apartado 1348, Caracas, Venezuela
Comprimo N. V., 21, Amstel, Amsterdam (C) Netherlands
Compagnia Tecnica Industrie Petroli, Rome, Italy
Whessoe Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Sociedade Chibridge de Construcoes Ltda., Av. General Justo, 275, Grupo 306, Rio de Janeiro, Brazil

replaces the former management committee, is composed of: **A. T. Proudfit,** Creole president; **H. W. Haight,** executive vice president; **L. Cade; H. A. Jarvis; G. Zuloaga;** and **C. V. Montague,** secretary.

LESLIE H. TRUE

Leslie H. True, president of Magnolia Pipe Line Co., Dallas, was elected chairman of the Committee for Pipe Line Companies at a recent meeting of the organization in St. Louis. True succeeds **Joseph L. Seger,** president of Interstate Oil Pipe Line Co., Shreveport. Other officers named were: **E. F. Morrill,** president of Mid-Valley Pipe Line Co., Longview, Tex., vice chairman; **Paul J. Bond,** Pure Transportation Co., Chicago, treasurer; **Fayette B. Dow,** National Petroleum Association, Washington, D. C., general counsel; and **Gordon C. Locke,** also of Washington, executive secretary and associate counsel.

Fred Sehmann has resigned as executive vice president of the North Texas Oil and Gas Association, effective December 31. Sehmann has held the post for 11 years and plans to retire. He was secretary-treasurer of Petroleum Producers Co. from 1921 until it was purchased by Sun Oil Co. in 1941. He also is secretary-treasurer of the National Stripper Well Association and a director of the Independent Petroleum Association of America.

Tulsa Section of A.A.O.D.C. Elects Officers

New officers of the Tulsa section of the American Association of Oilwell Drilling Contractors who took office recently are, left to right: J. L. Stauss, Falcon Seaboard Drilling Co., vice chairman; D. A. Sikes, Helmerich & Payne, Inc., outgoing chairman; F. G. McClintock, Zephyr Drilling Corp., chairman; and J. C. Hatfield, Holm Drilling Co., secretary-treasurer.

Harvey L. Hurley, formerly vice president of Duke Petroleum Co. in Calgary, Alta., has joined Mesa Drilling Co. in Denver as vice president.

LUMLY

T. M. Lumly, president of Refinery Engineering Co., was presented the Richards Memorial Award at the American Society of Mechanical Engineers banquet in the Hotel Statler in New York City, December 2. The award, established in 1944 in honor of Charles Russ Richards, who founded Pi Tau Sigma, national honorary engineering fraternity, is presented to a mechanical engineer for outstanding achievement within 20 to 25 years after graduation. Lumly is the sixth recipient of the award. He was honored for his work in refinery construction and operation, his contributions to shale-oil refining in Australia, and for his chemical and mechanical research activities.

These Men Direct Gulf Interstate Operations

Since the complete break between Trunkline Gas Co. and Gulf Interstate Gas Co., these former Trunkline officials have established their office in the M. & M. Building in Houston, where they are now directing Gulf Interstate's activities. They are, left to right: S. A. Taylor, vice president in charge of purchasing; G. M. Woodfin, vice president and secretary; Hy Byrd, president and chief executive officer; F. S. Young, vice president in charge of operations; and J. A. Staples, treasurer and chief accounting officer. Gulf Interstate was formed to build a gas system now being constructed from the Louisiana Gulf Coast to Boyd County, Kentucky. Originally the same group of officers directed both Trunkline, a Panhandle Eastern Pipe Line Co. subsidiary, and Gulf Interstate. Trunkline contracted for the engineering work on the Gulf Interstate line. That contract was terminated October 1, 1953, and the two companies are completely separated. Gulf Interstate now has no connection with Panhandle Eastern. A new slate of officers has been appointed for Trunkline.

E. A. Armbruster, Shell Oil Co., has been elected chairman of the San Joaquin Valley district of the Division of Production of the American Petroleum Institute. Other new officers include: **Hugh C. Mays,** Crescent Petroleum Co., first vice chairman, **J. J. Oliphant,** General Petroleum Corp., second vice president; and **Bob Torrey,** Southern California Gas Co., secretary. **Glenn V. Kersten,** Western Gulf Oil Co., is past chairman.

PERSONALS

William J. Barnett has been promoted by Creole Petroleum Corp. from head of the pipe-line section of the production department in Caracas, Venezuela, to assistant manager of the production department. Other changes include: **Ezra W. Drake,** from division petroleum engineer at Maracaibo to senior drilling administrator at Tia Juana; **Samuel J. Mathis** from division general engineer at Caripito to assistant district superintendent at La Salina; **John M. Pinkerton,** district superintendent at Caripito to district superintendent at Quiriquire; **Robert L. Stephenson,** from petroleum engineer in the production department at Caracas to division petroleum engineer at Maracaibo; and **Dr. Siro Vazquez** from manager of production department at Caracas to director and manager of production department.

Ralph W. Crockard, production foreman for The Texas Co., has been transferred from Pettus, Tex., to Seguin, Tex.

G. P. (Tige) Brown, with Pan Am Southern Corp. for 18 years, has resigned as manager of the land department to become an independent operator in Shreveport.

O. F. Moore, vice president of Ohio Oil Co. and manager of pipe lines, has been named manager of the company's

O. F. MOORE

C. H. GOMPF

new supply and transportation department, effective January 1. **J. R. Donnell,** now treasurer of Ohio, will become assistant manager of the new department which will coordinate the firm's varied operations in transportation and supply of crude oil and refined products. **C. H. Gompf,** presently assistant manager of pipe lines, will succeed Moore as pipe-line manager. **J. H. Rice,** division superintendent of pipe lines at Casper, Wyo., will move to the general offices at Findlay, Ohio, replacing Gompf. **Clare McElhinny,** assistant division superintendent at Casper, will advance to division superintendent, succeeding Rice. **M. D. King,** former assistant to the manager of refining and marketing, will join the refined products branch of the department as an assistant manager. **L. T. Weger** will move to Findlay as assistant manager of crude oil purchases and sales. He has been in charge of crude-oil sales in the Rocky Mountain area.

A. J. Morrison, formerly division mechanical engineer for Shell Oil Co. at Bakersfield, Calif., has been transferred to the area office at Los Angeles. **W. T. Nance** was moved from the area office to replace him. **Glen W. Webster,** development engineer, also was transferred from Bakersfield to Los Angeles. Other recent changes include: **E. C. James,** development engineer, from Casper, Wyo., to Ventura, Calif.; **P. E. Jenson,** from Los Angeles to New Orleans; and **W. D. Larrick,** production foreman, from Bakersfield to Ventura.

Award Given Tide Water

Frank W. Keebler, right, assistant general superintendent of Tide Water Associated Oil Co.'s refinery at Bayonne, N. J., is shown receiving an award made to the company by the U. S. First Army in appreciation of Tide Water's cooperation in granting leave to employes that they might participate in the Army Reserve training program. Lt. Robert A. White, left, of the refinery-control laboratory and commanding officer of the 982nd QM Petroleum Lab. Army Reserve unit, presents the certificate to Keebler on behalf of Col. Russell G. Rehkop, chief of the New Jersey Military District headquarters.

DEATHS

Robert Rutherford, Jr., 44, engineer with Standard Oil Co. of California, died recently in Los Angeles.

Victor F. Palmer, 66, former treasurer of Standard Oil Co. of California, died recently while en route from his home in Los Angeles to Chicago. He left Standard in 1940.

Mrs. LeVina Virtue Tibbens, 79, president of Tibbens Oil Co. since 1935, died recently in Tulsa. She had been president of the company since the death of her husband, who founded it. The firm was active in developing Glenn pool and brought in the discovery well in Tibbens pool, near Bristow, Okla.

James Melvil Shaffer, 83, died recently in Fort Worth. He was a partner in Shaffer Brothers, a firm active in the development of Drumright and Cushing oil fields in Oklahoma. Prior to his move to Oklahoma in 1905, he operated as a producer and drilling contractor in Pennsylvania, Ohio, Illinois, and Canada.

Walter Raymond Trelford, 67, retired general manager of the crude-oil department of Humble Oil & Refining Co., Houston, died recently. He joined Humble in 1919, and was general manager from 1935 until his retirement in 1945.

Herbert G. Naylor, 79, retired executive of the old Midwest Refining Co. and Standard Oil Co. (Ind.), died recently in Denver. He was active in the industry for 65 years and was generally credited with being the oldest living member of the American Petroleum Institute from point of service.

James L. Collins, 70, pioneer Texas independent operator who had lived in Corsicana for 30 years, died recently in Santa Monica, Calif.

William Henry Cederlof, 68, retired chief oil dispatcher for Gulf Oil Corp., died recently in Houston. He joined Gulf as a telegrapher at Beaumont in 1908.

Donald Rockwell Thompson, 68, petroleum engineer, died recently in Pasadena, Calif.

Martin J. Alworth, 83, retired driller, died recently in Tulsa.

A. A. (Joe) Davis, 77, retired pipeline construction foreman for Gulf Oil Corp., died recently in Lufkin, Tex.

Preparing Preliminary Job Estimates

. . . Use these charts for quick plant costimating

by W. W. Bond

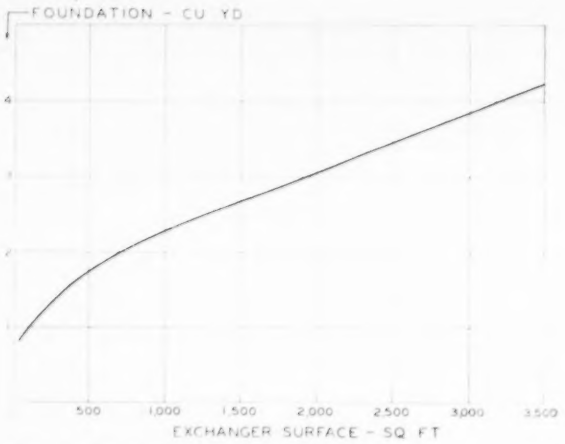


Fig. 1—TYPICAL EXCHANGER COST—This is for 150-lb. T.E.M.A. carbon-steel exchanger. (Based on Engineering News Record construction cost index of 545).

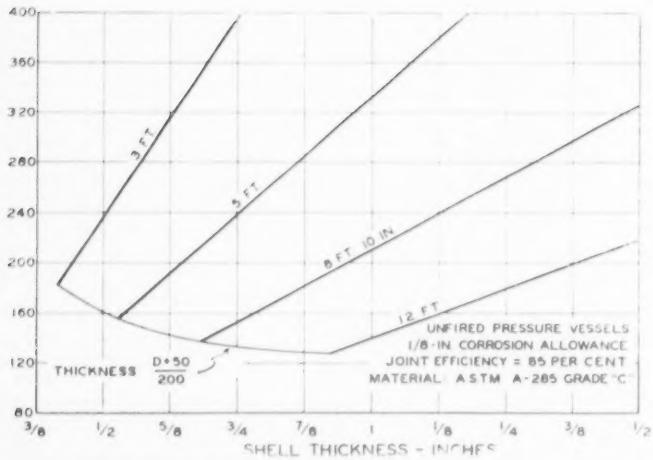


Fig. 2—SHELL THICKNESS—Unfired pressure vessels, 1/8-in. corrosion allowance, joint efficiency 85 per cent, material A.S.T.M. A-285, Grade "C."

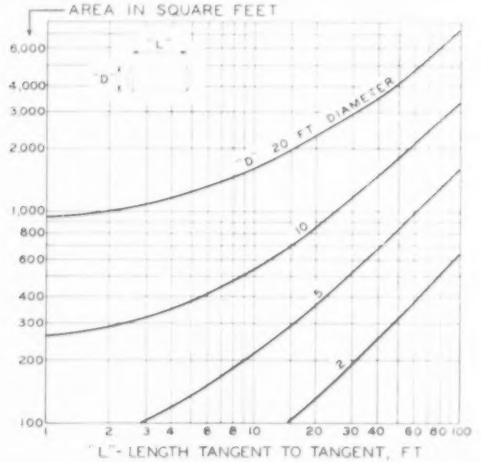


Fig. 3—VESSEL AREA—Surface area from length and diameter.

FOR the profitable direction of manpower and money expenditures, management in manufacturing or research activities demands quick and inexpensive cost estimates. Often these must be prepared without benefit of complete process and mechanical design data.

The charts presented here, or charts similar to these, may be used for rapid preliminary cost estimates with an accuracy of 20 per cent or better obtainable, where reasonable care and judgment is used. Often the accuracy obtained is within 10 per cent.

Two Principal Methods

These estimating methods can be applied both to pricing for total costs of processing equipment and pricing for differences between alternatives. Two principal methods are considered:

Author is with Standard Oil Co. (Ind.), Whiting, Ind.

1. If a process flow sheet only is available.—The engineer prices the process equipment and certain other items from his charts and tables and applies various percentages of these process equipment costs to calculate piping, insulation, instrumentation, indirect costs, fees, etc.

2. If the proposed equipment is similar to existing equipment.—Its cost can be estimated by applying proper exponential factors to correct for size and by adjusting for minor variations in the process. A listing of such exponential factors is given by W. L. Nelson *(The Oil and Gas Journal, October 5, 1950).*

Estimating Directly From Flow Sheet

Items of process equipment such as towers and trays, drums, exchangers, pumps, compressors, drivers, etc., are taken off the flow sheet, sized and priced.

1. Exchanger cost . . . This may be estimated on the basis of price per square foot. Fig. 1 shows a typical curve for costs of exchangers with carbon steel shells and tubes, based upon quotations received from vendors. Installation labor may be added at 3½ per cent to 10 per cent of these costs.

2. Vessels . . . Towers, drums, and reactors are most easily estimated from their weight. The thickness of the vessel wall may be obtained from a series of curves such as shown in Fig. 2. The total area of the vessel may be obtained from a similar set of curves as illustrated by Fig. 3. At 40.8 lb. per sq. ft. per inch of thickness, the nominal weight of the vessel can be quickly calculated.

Past experience shows there is a good correlation between the nominal weight of each class of vessel and the weight of the nozzles, manways, skirt, tray

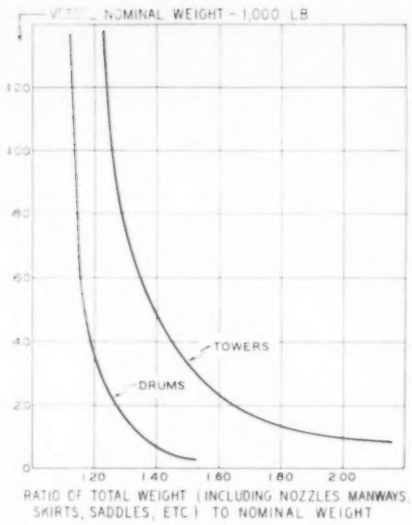


Fig. 4—VESSEL WEIGHT—Total vessel weight vs. nominal weight.

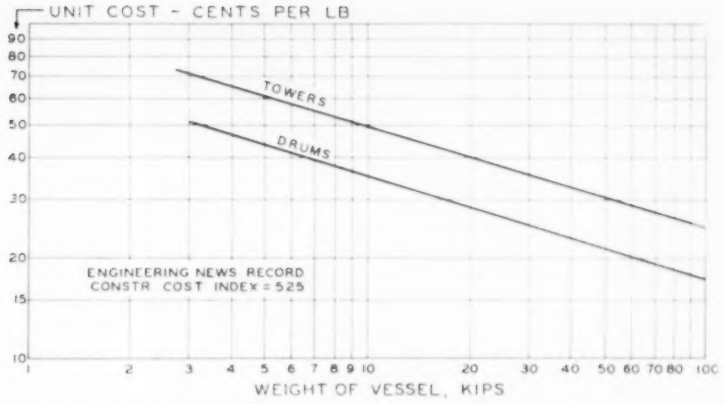


Fig. 5—TOWERS AND DRUMS—Average costs of typical process vessels including stress relief. Based on total weight. Material A.S.T.M. A-285, Grade "C."

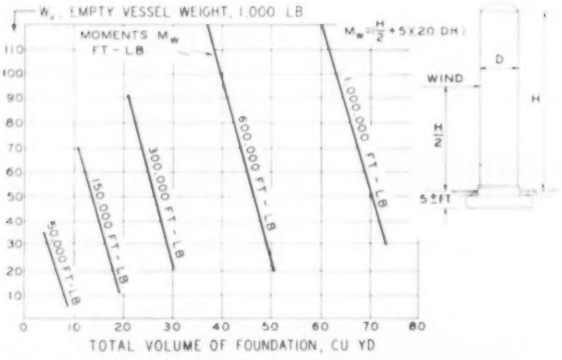


Fig. 7—FOUNDATIONS—Approximate volume of foundations required for towers, drums, and stacks using circular foundations.

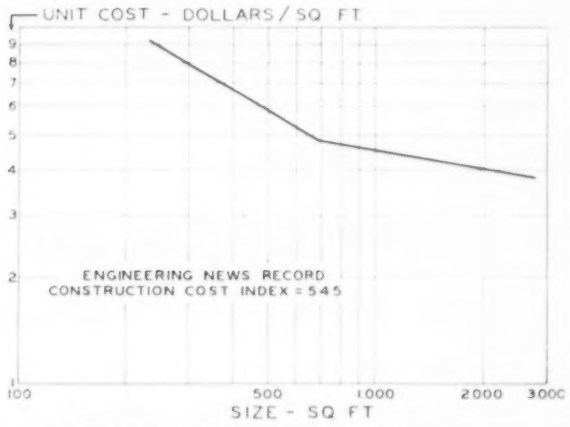


Fig. 8—EXCHANGER FOUNDATIONS may be estimated rapidly from a chart such as this.

supports, etc. This is shown in Fig. 4 from which the total weight of the delivered vessel is obtained. Fig. 5 shows the delivered cost plotted against total weight. Installation cost is about 15 per cent of the material cost for towers and trays and about 11 per cent for drums. Similar curves can be prepared for other items of equipment.

3. Pumps . . . These can be sized by use of selection charts in manufacturer's catalogs, and the cost of standard pumps and drivers can be obtained from lists of base costs plus the cost of extras desired. The base price covers a standard pump with steel case, Cr-Ni-Fe impeller, 11-13 per cent chrome trim, base plate and coupling. Mechanical seals, 11-13 per cent chrome rotating assembly, gland-oil or cooling-water piping, special alloys, etc., can be priced as extras, occasionally contacting the pump manufacturer by telephone for an approximate price if extraordinary features are involved.

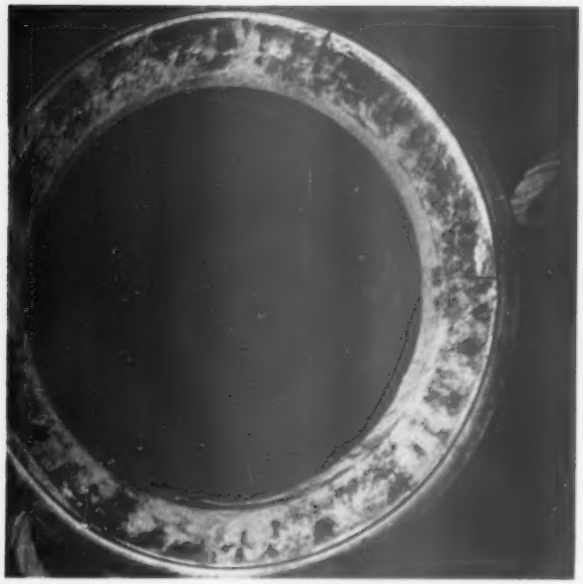
FIG. 6 — COSTS OTHER THAN PROCESS EQUIPMENT
Combination Crude Distillation, Coking, and Gas-Recovery Unit

Item—	Per cent of process equipment
Foundations (incl. paving)	12.9
Trenches and sumps	7.8
Piping (incl. hangers)	61.3
Buildings	0.8
Structural and Support Steel	14.2
Instruments	7.6
Insulation	8.7
Fireproofing	2.0
Electrical	15.8
Painting	5.8
Special equipment (incl. elevators)	2.3
Miscellaneous equipment	3.3

4. Piping, etc. . . . After the sum of the process equipment costs has been obtained, the cost of such items as piping, electrical equipment, instruments, painting, insulation, etc., may be computed for the most part as percentages of process equipment. The percentage to be applied for each of these items varies depending upon the type of processing unit being estimated and the intended quality of design. Fig. 6 shows a tabulation of percentages which apply to a combination crude, coking, and gas-recovery unit as taken from a contractor's estimate.

5. Foundations . . . For closer accuracy, foundation costs are frequently estimated on the basis of the volume of concrete required. Fig. 7 shows a quick method of obtaining the approximate volume of concrete in foundations for vertical towers, drums, and stacks. Note that the wind moment,

(Continued on page 127)



Cracked and eroded stellite seat for riser plug valve. (See photo at right.) This is the catalyst riser line to the reactor in an Ortho-flow unit.

Closeup of eroded riser plug valve. In the foreground is a half plate of the regenerator stack slide valve.

Some pointers on

INSPECTION OF REFINERY VESSELS

by Ervin L. Weiss

MOST oil refineries make an annual inspection of process equipment; however, in some cases it is necessary to make inspections at more frequent intervals to assure safety of personnel and continued operation.

Deterioration of refinery equipment is usually caused by corrosion. Usually an idea of the corrosion rate can be determined from process study or from experience in operating similar units. Also, some corrosion will be peculiar to that particular unit. Study of these factors will dictate frequency of the first few inspections of a new unit.

After several inspections, a corrosion trend for the unit can be determined. Then some sections can be marked for detailed frequent inspections and some can be left for routine inspections.

Inspection Practices

Towers and drums . . . When these are inspected, the vessels must be blanked and gas freed before entering. The vessel should then be cleaned to bare metal, the extent of cleaning depending on the inspection desired. For instance, if welds in an area were suspected of cracking, those weld seams should be sandblasted. Further inspection might warrant the use of Magnaflux and radiographing equipment.

Author is in the engineering department, Canadian Oil Refineries, Ltd., Sarnia, Ont.

Inspect for cracks, corrosion, erosion, hydrogen blistering where applicable, and other defects. If lined, inspect lining for defects. A small hand scraper is useful for removing coke and scale to expose base metal. Baffles, trays, bubble caps, downcomers, and other internals should also be examined. A large C-caliper is useful. At each manway, the vessel wall and manway neck should be calipered. Any loss in metal thickness noted by calipering calls for a careful check of the vessel in that area. If corrosion appears as pitting, the depth of pits and extent can be measured. Lining with stainless steel or other material will invariably be required sooner or later.

If corrosion is even, vessel may be hammer tested, thin spots detected, and test holes drilled. Steel plugs are then screwed in and welded. The practice of drilling holes and screwing in plugs for removal to obtain future thickness readings has been discontinued by many refiners and by firms specializing in refinery inspection. All nozzles are calipered or hammer tested.

The attached form has been found adequate for inspection purposes and is quite simplified. Most of our vessels have been fabricated in accordance with the 1950 edition of the A.S.M.E. Unfired Pressure Vessel Code. For some equipment the 1949 edition applies. Following repairs, all vessels are hydrostatically tested to 1½ times or twice the design pressure, depending on the applicable code. Retiring thicknesses are calculated by the A.S.M.E. U.P.V. code as follows:

(a) For shells under internal pressure

$$P = \frac{S E t}{R + 0.6 t}$$

where

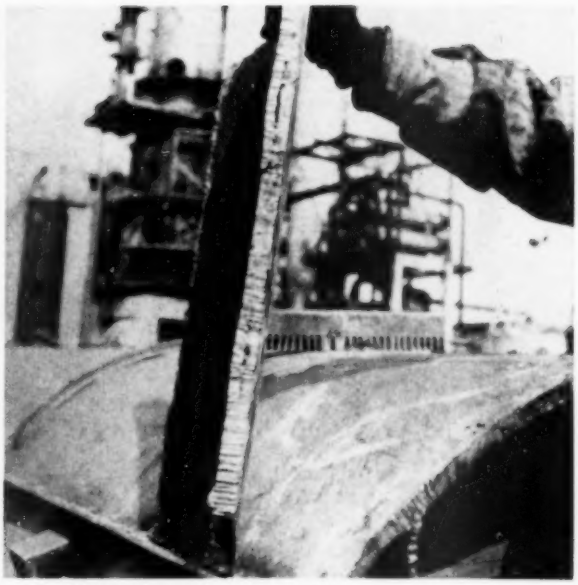
P = design pressure, psig.
S = max. allowable working stress, psi.
E = joint efficiency, per cent
R = inside radius, in.
t = min. thickness, in.

(b) For semiellipsoidal heads under internal pressure

$$P = \frac{2 S E t}{D + 0.2 t}$$

where the symbols have the same mean-

Erosion pattern on cone of a regenerator cyclone, Orthoflow unit.



Hydrogen blistering in shell of absorber-stripper tower. This section cut out near reboiler inlet to tower.

ing as above and D = inside diameter of the head skirt, in.

For more complete details, the code should be referred to.

Exchangers . . . Exchangers are usually opened for inspection and cleaning. Tube bundles are pulled, cleaned, and inspected. Shell, bonnet, channel, and floating head are calipered and recorded. All nozzles are listed and calipered or hammer tested. Retiring thicknesses are determined by the A.S.M.E. Unfired Pressure Vessel code previously mentioned. Because tubes are so thin, it is not practical to fix a minimum retiring thickness. Careful hammer testing will reveal tube thinning; pitting can be seen visually.

Exchangers are always hydrostatically tested after assembly whether repaired or not. If retubing is indicated and is inconvenient, some tubes may be plugged off with metal plugs. Not more than 25 per cent of the tubes should be plugged as undesirable thermal stresses are set up. No particular form is used to record findings; a sketch may be desirable to show some particular results.

Fired heaters . . . Heaters are thoroughly inspected each time they are shut down for cleaning. Connecting piping and steam connections are blanked. Most heaters use mule-ear-type headers with removable plugs. Plugs are hot bolted immediately on cutting oil flow to the heater and steaming. Tubes are cleaned with air-operated mechanical cleaners. If thermal decoking is practiced, only slight mechanical cleaning is necessary. After the heater has cooled, the interior is inspected. This includes structural steel, insulation, refractory, burners, hangers, breeching, etc.

Tubes are examined for oxidation, warping and bulging, and sometimes hammer-tested. Tubes are calipered at the roll and up to 3 ft. from the end (the length of the caliper). Fittings are calipered less frequently as they have a large corrosion allowance. They are checked for stretching when replacing tubes to insure the correct amount of roll.

Retiring thickness of tubes can be calculated from the following formula:

$$t = \frac{P\,D}{2S + 0.8\,P} + C$$

where

t = min. tube wall, in.
P = operating pressure, psi.
D = o.d. of tube, in.
S = allowable stress, A.S.M.E. code
C = corrosion allowance.

The above formula is a modification of the Barlow and Lamé formulas, and is that used by the A.S.M.E. Power Boiler Code. However, this is only an approximate limit. Corrosion is often uneven, sometimes eccentric and can vary throughout the tube. Experience has shown that a minimum wall thickness of ⅛ in. is desirable if the calculated thickness is below ⅛ in. An additional allowance of one-half the tube expansion is permissible at the roll. This is usually an arbitrary 4/64 in.

For example, consider 6-in. pipe used as a heater tube. (Most tubes are smaller than this.) Assume operating conditions of 200 psi. at 700° F. (Calculated retiring wall thickness is 0.095 in. This is below the recommended minimum, so retiring is set at ⅛ in. or 0.125 in. (As piping, retiring would be 0.18 in.) This heater tube would be retired if any of the following occurred:

(a) Tube o.d. 6 40/64. Retire at 6 24/64 i.d. tube, or retire at 6 28/64 i.d. roll.

(b) If any bulge is 8/64 in. or larger measured on the diameter.

(c) Severe oxidation. Experience determines when this is severe.

Return fittings . . . Minimum thickness is equal to the thickness of valve body of the same size, plus 25 per cent. Original thicknesses are quite liberal; they may be three times the retiring thickness. After repeated rollings, the fittings may become oversized and have to be replaced. The standard size is tube o.d. plus 2/64 in. When fittings have stretched to tube o.d. plus 8/64 in. they are retired. Note that when rolling tubes, as the fitting i.d. increases the amount of roll must be increased an equal amount.

Tubes and fittings are numbered in sequence from the heater inlet through to the outlet. The ends are identified as "inlet end" and "all return end" or sometimes as "top and bottom" or "east and west," etc.

Where heaters have all-welded return bends with no removable plugs, inspection is more difficult. Hammer testing and thickness readings using an Audigage or Penetron are used. In normal use the tubes can be hammer tested and located if thin. One or two tubes can then be cut out and measured. New

CANADIAN OIL REFINERIES LTD.

INSPECTION REPORT

VESSEL | UNIT | DATE

DATA
SIZE | SER NO
MFR
DES PR | DES TEMP
OPER PR | OPER TEMP

TOP | BOTTOM

	SHELL UPPER	SHELL LOWER	HEADS UPPER	HEADS LOWER
ORIGINAL T				
CORR ALLOW				
REQUIRED T				
PRES MIN T				

NO	T	REMARKS
THICKNESS READING		

CANADIAN OIL REFINERIES LTD

INSPECTION REPORT

HEATER | UNIT | DATE

TUBES | INLET TEMP | PRESS | OUTLET TEMP | PRESS
MTL | SIZE

HEADERS | MAKE | MTL | RETIRING THICKNESS

TUBE NO	INSIDE DIAMETER: INLET END ROLL	INLET END TUBE	RETURN END ROLL	RETURN END TUBE	RETIRING ROLL	RETIRING TUBE	HARDNESS THICKNESS	REMARKS

CANADIAN OIL REFINERIES LTD

INSPECTION REPORT

PIPING (IN ORDER OF FLOW) | UNIT | DATE

LINE	ORIG T	MIN T	PRESENT T	HAMMER TEST	REMARKS

INSPECTION REPORT FORMS used at Sarnia refinery, Canadian Oil Refineries, Ltd. At left is form used for pressure vessels. At right top is report blank used for heat exchangers, while at bottom right is that used for piping.

tubes would replace these. Since alloys such as 5 per cent chrome, 0.05 molybdenum, and 12 per cent chrome harden in use, care must be exercised when hammer testing old alloy tubes. Sometimes a number of small "weep" holes are drilled from the outside of the tube to the retiring thickness. A sharp-pointed drill is used. If the tube wall thins out, it will show up as a slight leak instead of possibly bursting.

Piping inspection . . . This is done annually to obtain a corrosion trend. When some history is obtained, this governs future inspection.

One satisfactory system, particularly on less-complicated units, is to begin with the feed to the unit and carry right through. Data are listed with reference to direction of flow and equipment. For example, 6 in. line from P5 to T4—first gate valve 0.40 in. Valves are dropped and calipered; lines are calipered at flanged connections. Smaller screwed lines are hammer tested. Sometimes sketches are made of each line showing successive readings of each inspection.

When a calipered reading shows even minor metal loss it should be thoroughly checked throughout its length. Frequently there will be major corrosion or erosion elsewhere around bends or headers where no caliper readings were possible.

Hammer testing is one of the most useful methods of checking piping. However, since the lines usually contain coke or sludge and are insulated, feel rather than sound must be relied on. This limits line size to 8 in. standard-weight pipe. If larger lines hammer test "soft," they are already past retiring and the purpose of inspection is defeated.

Some instrument for obtaining wall thickness nondestructively is a great help. Otherwise test holes can be drilled, thickness measured, plugs screwed in and seal welded. To avoid residual stresses caused by welding plugs, one major refiner cuts the line completely in half when taking measurements, and rewelds it.

Retiring thickness is based on the A.S.A. code for pressure piping. The applicable Lamé formula is:

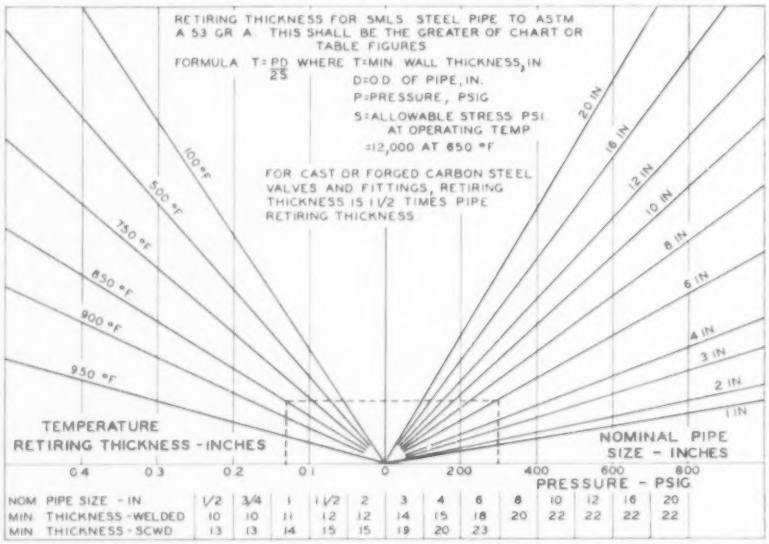
$$t = \frac{PD}{2S + 0.8P} + C$$

where

t = min. wall, in.
P = operating pressure, psi.
D = pipe o.d., in.
S = max. stress, psi. at operating temperature as given by the code
C = corrosion allowance

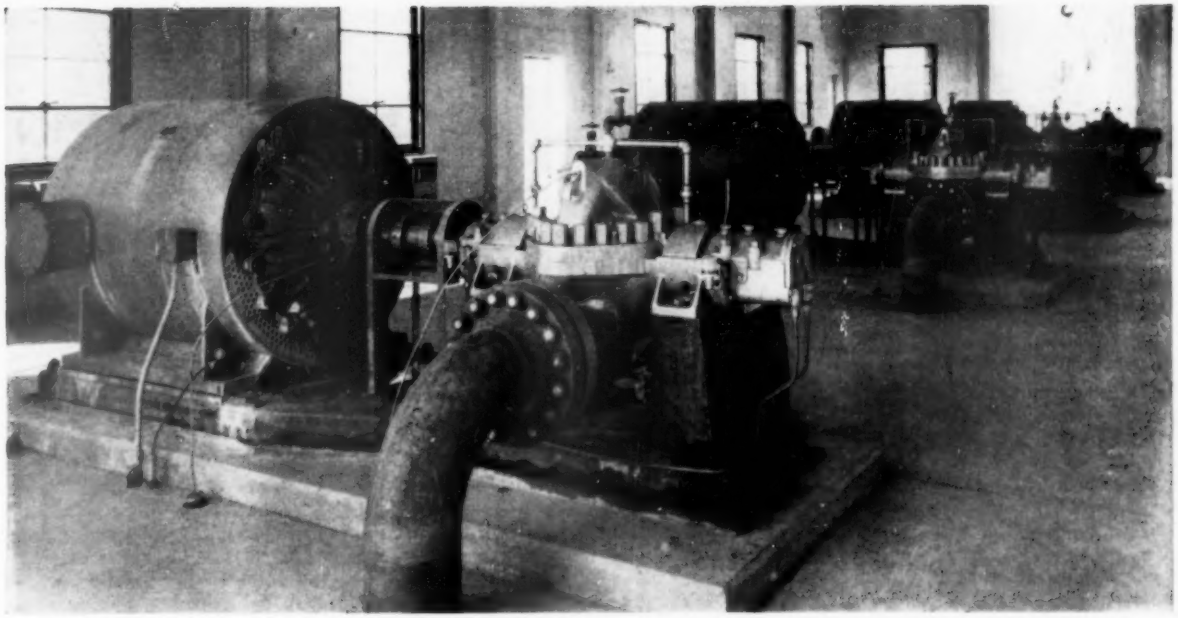
Experience has shown that certain minimum thicknesses are required; the calculated thickness usually applying at high temperatures. The minimum thick-

(Continued on page 138)


RETIRING THICKNESS FOR SMLS. STEEL PIPE TO ASTM A 53 GR. A. THIS SHALL BE THE GREATER OF CHART OR TABLE FIGURES
FORMULA T=PD/2S WHERE T=MIN. WALL THICKNESS, IN.
D=O.D. OF PIPE, IN.
P=PRESSURE, PSIG.
S=ALLOWABLE STRESS PSI AT OPERATING TEMP =12,000 AT 650 °F
FOR CAST OR FORGED CARBON STEEL VALVES AND FITTINGS, RETIRING THICKNESS IS 1 1/2 TIMES PIPE RETIRING THICKNESS
100 °F
500 °F
750 °F
850 °F
900 °F
950 °F
20 IN
16 IN
12 IN
10 IN
8 IN
6 IN
4 IN
3 IN
2 IN
1 IN
TEMPERATURE RETIRING THICKNESS - INCHES
0.4 0.3 0.2 0.1 0
NOMINAL PIPE SIZE - INCHES
200 400 600 800
PRESSURE - PSIG

NOM PIPE SIZE - IN	1/2	3/4	1	1 1/2	2	3	4	6	8	10	12	16	20
MIN THICKNESS - WELDED	10	10	11	12	12	14	15	18	20	22	22	22	22
MIN THICKNESS - SCWD	13	13	14	15	15	19	20	23					

RETIRING THICKNESS for seamless steel pipe can be estimated from this chart.



In selecting motors for pipe-line pumping stations important factors are horsepower, r.p.m., voltage, number of phases, frequency, and type of motor and motor enclosure. This photo shows installation at Platte Pipe Line Co. pumping station.

How to Select Motors and Controls

. . . for pipe-line pumping stations

by R. J. Osborn

SINCE pipe-line pump stations vary widely in size and type, this discussion of pump and controls selection is divided into three sections: (1) Large-diameter trunk-line stations using motors 800-hp. and larger, (2) smaller trunk and gathering stations using motors 200-500 hp., and (3) field pumps and stations using motors up to 200 hp. In selecting a motor, it is necessary to specify (1) horsepower, (2) r.p.m., (3) direction of rotation (in some cases), (4) voltage, (5) number of phases, (6) frequency, (7) type of motor, and (8) type of motor enclosure.

1. Trunk-Line-Station Motors

Since pipe-line pump stations will be purchasing power rather than generating it themselves, the frequency and phase of the motor selected must conform with the characteristics of the power source. Although 60-cycle, 3-phase power is the only type available over most of the United States, the few exceptions to this standard make it advisable that the engineer check these items before writing motor specifications. Most three-phase motors are suitable for operation in either direction of rotation; however, in some instances the fans attached to shafts of the motor and used for circulating air through the motor must be operated in one specific direction. If the motor selected is of this type, it is necessary to specify the direction of rotation corresponding with the rotation of the pump being driven.

Horsepower . . . The modern trunk-line station generally has two or three high-speed centrifugal pumps of equal capacity and a single pump similar to the other which has half the capacity. The pumps are usually operated in series to provide the required pressure. The horsepower of the motor selected should be adequate to drive the pump under the maximum throughput conditions.

Since most lines are designed for a higher ultimate capacity than that required at the time of construction, initially the motors may operate at low load. For maximum efficiency, it is desirable to have the motor operating at as near full load as possible. Therefore, from the standpoint of over-all efficiency as well as initial cost, it is desirable to select the smallest size electric motor which is adequate.

At least one pipe-line company makes it a practice of specifying Class B insulation so that peak horsepower requirements may be met by overloading the motor rather than sacrificing efficiency at the lower loads. The pump manufacturer must furnish the test curves which show the horsepower input required for various operating conditions of a given pump since centrifugal pumps vary in efficiency from around 60 per cent to 85 per cent.

Speed . . . Until the advent of the Big Inch Pipe Line, pumping characteristics favored the 3,600-r.p.m. pumping units. However, at capacities in excess of 135,000 bbl. per day, 1,800-r.p.m. centrifugal pumps may be designed with operating characteristics equal to or better than 3,600-r.p.m. pumps.[1] Initial cost of the lower speed pumps is higher, but this is offset by a lower motor cost at the lower speed. Considerably lower mechanical maintenance of pump and motor is to be anticipated at the lower speed, as well as reduced noise level.

Voltage . . . A few installations have recently been made of 4,160-volt motors.

"Simplicity and ruggedness of the squirrel-cage induction motor has resulted in its universal acceptance for pipe-line pumping."

However, pipe-line pumping motors are ordinarily located so that the length of the secondary runs from the substation to the motors is short. This means that any saving in conductor and conduit size at the higher voltage is small. The advantage of the 4,160-volt grounded wye system does not readily justify the higher motor cost for most pipe-line stations.

Large pipe-line stations are ordinarily fed from a separate substation with a firm source so that nameplate voltage is readily maintained at the motor.

Type of motor . . . The simplicity and ruggedness of the squirrel cage induction motor has resulted in its universal acceptance for pipe-line pumping. The high efficiency and power factor of the two and four-pole induction motor leaves little to be gained by the use of synchronous motors. The slight increase in efficiency and the improved power factor are not considered sufficient to offset the added maintenance on slip rings, exciters, and more complicated control devices. The squirrel cage induction motor is the type most readily designed with the enclosures required in the petroleum industry.

Remote and automatic control of large pump stations is a reality today and will be more widely used in the future. Unattended operation places an even greater emphasis on reliability, simplicity, and ruggedness. These factors favor the squirrel cage motor. However, the variable speed features of the wound rotor motor offer the possibility of essentially stepless control of pipe-line flow without the loss of power, as occurs when the pump discharge is throttled. Wound rotor motors are in use, but to a very limited extent.

No serious obstacles are apparent to utilizing automatic speed control based on either pressure or flow control. In fact, pump speed is being automatically controlled to maintain balanced engine loads on a diesel powered pipe-line station in Venezuela at the present time.[2]

A comparable arrangement should be possible whereby the speed of a wound rotor motor is automatically adjusted to regulate line flow or pressure. To the author's knowledge, no such system is in operation, but such a system seems to warrant consideration where high efficiency and flexibility are of prime importance.

Type of enclosure . . . The newer electric pump stations are using a variety of motor enclosure types. Of several systems recently completed or now in construction, at least one is using totally enclosed fan-cooled motors, some are using forced-ventilated motors with air intake and discharge through the motor base, and one company is using a weather-protected type of motor installed outdoors.

Open motors . . . The first electric-powered pipe-line pump stations installed standard open motors in the same room with the pumps. It was felt that the absence of arcing contacts on the induction motor made them safe for operation under these conditions. A number of stations so constructed are still in operation and there has been no serious record of fire or explosion due to motor failure in such installations. However, on present-day installations, it is considered desirable to take added precautions against the possibility of motor failure igniting petroleum vapors present near the pumping equipment.

Fire protection . . . There is considerable difference of opinion as to how to protect against possible fires and explosions. Most stations constructed before World War II used open-type motors with the motor shaft extending through a wall separating the motor room from the pump room. This method still offers a number of advantages. The use of open-type motors results in a minimum initial motor cost. By adding suitable inexpensive ventilating equipment, the motor room may be kept at a slightly higher pressure than the pump room to prevent any leakage of vapors into the motor room. When repairs are being made to the motor, no special precautions need to be taken as the machinist or electrician is not working in a hazardous area. The chief disadvantage of this arrangement is the inconvenience to the operating and maintenance personnel when they must walk around the building to get from the motor to the pump. Large installations may require special ventilation to remove the heated air from the motor room so that it is not recirculated over the windings.

The use of totally enclosed fan-cooled explosionproof motors eliminates the need for a firewall between pump and motor. In addition to the added convenience of eliminating the barrier between pumps and motors, this type of enclosure affords maximum protection to the motor windings. Outside air does not circulate over the windings so all dirt, foreign matter, and moisture are excluded. The cost of totally enclosed fan-cooled enclosures is high compared to other types, especially in the larger motor sizes.

In order to be considered explosionproof, a motor enclosure must be designed to contain an internal explosion without any flame reaching the outside where it might ignite explosive vapors. To meet this requirement, a flame arrester must be installed at each end of the shaft. Clearance between this arrester and the shaft is very small. Extensive damage results if bearing wear is permitted to reach the point where the shaft begins touching the flame arrester. This fact, combined with the difficulty of assembling and disassembling a totally enclosed fan-cooled motor tend to higher maintenance costs than for open-type motors. To minimize moisture accumulation through condensation, totally enclosed motors should be equipped with suitable breathers and drains; or space heaters should be automatically connected when the motor is stopped.

Forced-ventilated motors . . . The high initial cost and other disadvantages of the totally enclosed fan-cooled motor have resulted in a trend toward forced-ventilated motors in the large pipe-line pumping installations. These motors differ from a standard open motor chiefly in that the air intake and discharge are hooded for connection to outside ducts. When considering the initial cost of this type installation, one must add to the cost of the motor the cost of the ducts and blowers necessary to provide the forced ventilation. The circulation of outside air under pressure through the motor prevents

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the entrance of any gas from the pump room. Interlocks should be provided so that the blowers must be operated for sufficient time to purge the motor and ducts of all accumulated gases before the motor may be energized.

Outdoor installations . . . A few of the new pipe-line pump stations are following the lead of the electric power companies and installing pumps and motors outdoors. This effects an obvious saving in building cost. There is considerable difference of opinion as to type of enclosure required for outdoor installations. Some companies consider weather-protected enclosures adequate since there is little possibility of sufficient concentration of gases to form an explosive mixture. Other companies prefer to use totally enclosed fan-cooled motors, explosionproof, outdoors to protect against the possibility of a serious pump-case split or line break and a motor winding failure occurring simultaneously. Unquestionably, the totally enclosed fan-cooled motor is safer while the weather-protected motor is much less expensive.

2. Small Trunk Line Station Motors

Speed . . . Smaller trunk-line stations and a few of the larger stations classed as gathering stations may utilize motors from 200 to 500 hp. Considerations in selecting these motors differ little from the larger applications. Pump characteristics in these sizes favor the 3,600-r.p.m. speed.

Voltage . . . These motors are generally 2,300 volts although initial cost of equipment may favor 440 volts in some instances. However, power rates sometimes favor the customer who takes service at 2,300 volts. Also over a period of years, equipment may be moved around over the system to meet new requirements and there is a definite advantage in having the same voltage rating on all motors in this size range.

Type of enclosure . . . The total cost of a forced-ventilated motor and its auxiliaries bring it more nearly in line with the cost of an explosionproof motor in these sizes. The explosionproof motor is therefore receiving less competition in this size range than in the larger sizes.

3. Gathering Units

Horsepower . . . Factors in the selection of motors under 200 hp. differ widely from those involved in selecting the larger equipment. Gathering units in sizes up to 200 hp. are commonly V-belt-driven horizontal duplex double-acting piston pumps. These pumps are equipped with interchangeable cylinder liners so that the volume of oil pumped may be easily changed in the field as production in a given area rises and falls.

The maximum permissible working pressure of the pump decreases as the rate increases so that the maximum horsepower which may be required is nearly constant over the range of the liner sizes. To provide maximum flexibility, the motor selected should be large enough to utilize the maximum rating of the pump. Pump manufacturer's specifications as to horsepower requirements should be checked for specific conditions. However, a convenient approximation is

$$HP = \frac{(\text{Bbl./hr.})\,(\text{psi.})}{2{,}000}$$

The above statements apply to field units which are to be used under varying conditions. If conditions are such that maximum operating pressures and/or pumping rates are not anticipated, lower initial cost and lower operating costs will be effected by selecting the smallest motor that will meet the requirements. Particularly on the larger pumps which require slower-speed motors is this important. The 900-r.p.m. motors necessary for the larger units have power factors of approximately 50 per cent when running lightly loaded. This low power factor usually results in excessive demand charges or requires the addition of power-factor correction capacitors.

Type of motor . . . Slow-speed, high-displacement pumps used for applying suction to field lines may result in objectionable line-voltage fluctuation. To minimize this fluctuation, a high-slip motor should be selected for these applications.

For other applications, the normal-slip motor is satisfactory since the load is much more constant. Discharge pumps are not usually subjected to high pressures at the time they are started and therefore do not require especially high starting torque.

Speed . . . In selecting the speed of the motor for the pump unit, it is necessary to compare the costs and convenience of the associated V-belt drive. Initial cost and operating efficiency favor the 1,800-r.p.m. However, it is often more practical to select a 1,200-r.p.m. motor due to the cost of the V-belt drive required at the higher speed. In some instances, the larger units will be more economical at 900 r.p.m. Special motor bearings may be required for the use of V-belt drive with the larger motors.

Voltage . . . Standard motors in the size ranges involved are 220/440 volt. Twenty-three-hundred-volt motors are readily available in the larger sizes, but the cost of the motor and other electrical equipment favors the lower voltages.

Type of enclosure . . . In nearly all new installations, field and gathering pump units are being installed outdoors. Some companies are using explosionproof motors, but many feel that a motor enclosure which merely affords protection against the weather is adequate. To meet the requirements of the oil industry, some motor manufacturers are now building motors with what is essentially an improved dripproof enclosure and especially moisture-resistant insulation. These motors sell for about the same price as a standard dripproof motor and afford adequate protection from rain and snow in most areas. In addition to the low first cost, these motors carry 40° C. rating. The 1.15 service factor thus available may in some instances permit one size smaller motor rating than would be required for a totally enclosed motor. If any enclosure other than totally enclosed is used, it is important that all openings be screened to keep out rodents and insects.

Some climatic conditions will require totally enclosed motors although the open type referred to will be found satisfactory in most areas not subjected to excessive rain or snow.

Single-phase motors . . . The rural-electrification program is making single-phase power available for a number of field-pump installations. Generally motors as large as 7½ or 10 hp. are permitted on these lines for pipe-line pumping and in some instances, even larger motors may be connected.

Capacitor start-capacitor run and repulsion-indication single-phase motors are available in the 5, 7½, and 10-hp. sizes generally encountered in pipe-line pumping. The capacitor motors have quite adequate starting torque together with higher efficiency and power factors, making them generally preferred. However, in cases where minimum starting current is of extreme importance, the repulsion-induction motor should be used in spite of the disadvantage of commutator maintenance and slightly lower power factor and efficiency.

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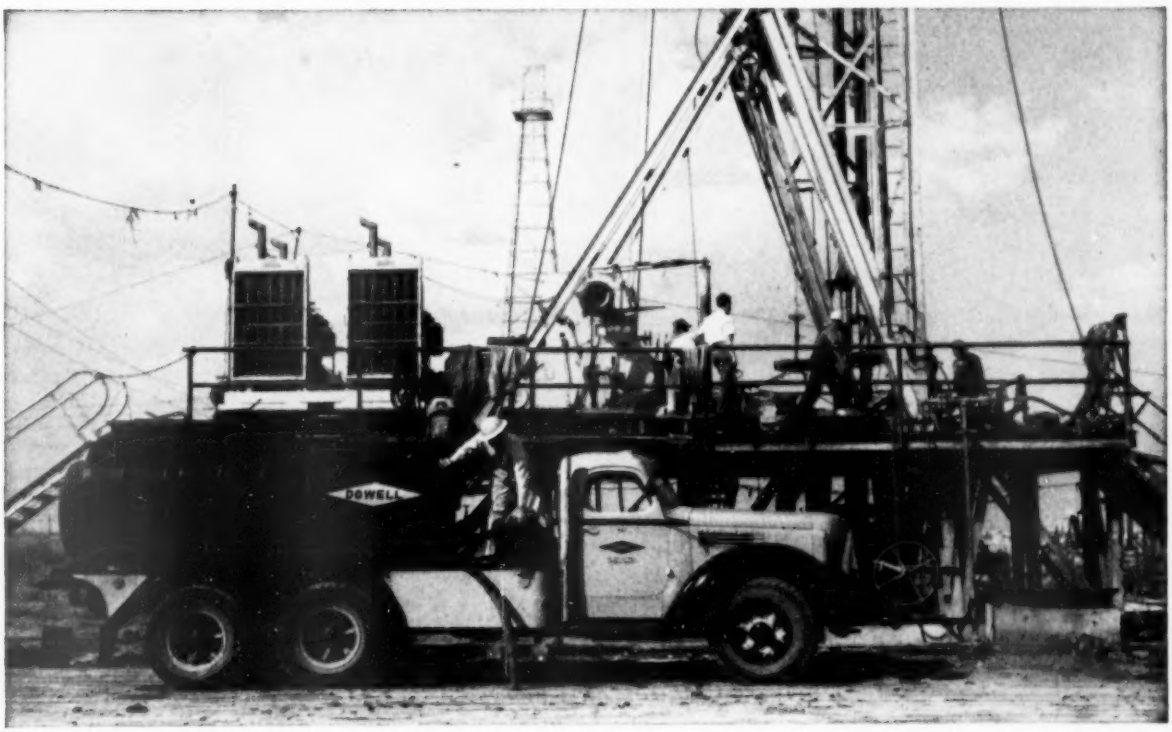

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Metal-clad switchgear provides a high degree of safety

Phase converter . . . A device known variously as a phase converter or phasing unit has become generally available in recent years. This device permits the use of standard three-phase motors on single-phase lines. The device consists of a number of oil-filled capacitors, motor-starting capacitors, and a voltage relay. Two wires of the single-phase service are connected directly to two of the motor leads. The third motor lead is connected to one of the single-phase service lines through the oil-filled capacitor. During starting, the starting capacitors are in parallel with the oil-filled capacitors.

Three-phase motors operated in this manner have a noticeable unbalance of current in the three windings. At low loads the current in the lead from the capacitors may become quite high unless the capacitance is reduced by disconnecting some of the capacitors. The use of these units is not recommended where widely fluctuating loads are encountered.

The use of these devices with three-phase motors for pipe-line field-pump units has proved satisfactory in a number of instances. The advantage of their use over regular single-phase motors lies in lower first cost and generally better delivery of the three-phase motor and converter. In order to limit the horsepower requirements to the desired value on single-phase installations, it is generally necessary to run the pumps below normal speed. This often requires a 1,200-r.p.m. or slower motor. Particularly when the slower motor speeds are required, the cost and delivery are better for the phasing unit.

4. Trunk-Line Station Control

In selecting the control equipment to be used for large trunk-line motors, the main considerations are (1) the size of the units, (2) whether reduced-voltage starting is necessary, (3) interrupting capacity requirements, and (4) whether the equipment is to be mounted indoors or outdoors.[3]

When the total number of pump units at a station is determined, some consideration should be given to the fact that subdivision of the station capacity into a number of units is advantageous, not only for flexibility of station operation, but also because it improves power service conditions by reducing the motor-starting demand in relation to the running load. This may mean the difference between use of full-voltage starting or the more complicated and expensive reduced-voltage starting equipment.

Full-voltage starting . . . This is practical in nearly all instances since service is usually through transformers carrying no other load, and the starts are very infrequent. One company's recently completed trunk line uses full-voltage starting throughout for motors as large as 1,750 and 1,250 hp.

COMPARISON OF COSTS OF 1,000 HP. MOTORS IN VARIOUS TYPES OF ENCLOSURES, SPEEDS, AND VOLTAGES

1,000 Hp.—2,300 Volts

	Rise, °C.	1,800 r.p.m.	3,600 r.p.m.
Open type	40	$ 9,575	$15,025
Weatherproof	50	11,975	18,025
Base ventilated	50	11,975	18,025
Explosionproof	55	22,125	28,250

1,000 Hp.—4,160 Volts

	Rise, °C.	1,800 r.p.m.	3,600 r.p.m.
Open type	40	$11,100	$17,425
Weatherproof	50	13,875	20,900
Base ventilated	50	13,875	20,900
Explosionproof	55	25,650	32,775

Standardize . . . It is advantageous to standardize on equipment throughout a given trunk line, so the interrupting rating is usually determined by the maximum requirement at any single station on the line. This may justify use of transformers having higher than normal impedance or current-limiting reactors at the limiting stations.

Circuit breakers . . . Motor-control equipment is available with interrupting capacity ratings of 25,000, 50,000, 100,000, 150,000 kva., and higher. Trunk-line stations generally require interrupting capacities of 50,000 to 150,000 kva. Selection of trunk-line control equipment involves a choice of contactors in combination with current-limiting fuses or power circuit breakers. There is a growing trend to the use of circuit breakers in unitized metal-clad switchgear. While this equipment is highest in first cost, it has some important advantages for pipe-line operation. The circuit breaker, operating relatively infrequently, requires a minimum of maintenance. The low maintenance requirement may be attributed at least in part to the fact that the circuit breaker does not drop out on momentary voltage dips and then reclose with a heavy current surge to the motor, as does a contactor with time-delay undervoltage relaying.

The circuit breaker eliminates the need of fuses with the attendant problems of replacement stocking, and possibility of single-phase operation. With removable breakers and an interchangeable spare breaker, maintenance work on the breaker units is performed with minimum down time, and in the event of breaker trouble, the spare provides insurance against a prolonged outage. The removable breaker provides a disconnecting means of the safest type. Metal-clad switchgear provides a high degree of safety to both the operating and the electrical maintenance personnel.

Metal-clad switchgear and contactors are both available for either indoor or outdoor installation. If building construction is of an expensive type, there is an economic advantage to outdoor installations although maintenance is more convenient if the equipment is indoors.

If contactors are utilized for motor starting, short-circuit protection is generally provided by the current-limiting fuses and overload protection by thermal overload relays. If circuit breakers are used, short-circuit protection is provided by a suitable overcurrent relay and overload protection by an ambient-temperature-compensated thermal overload relay.

Temperature protection . . . Better over-temperature protection can be obtained through use of temperature-measuring devices located in the motor itself. These devices are becoming more widely used. On the larger motors, it is possible to have embedded detectors installed in the stator slot beneath the winding. These embedded detectors may be used with external auxiliary equipment to give winding temperature indication or automatic shutdown, or both.

A simpler, less expensive thermostatic device may be installed on or between the end turns of the winding near the stator core. Such a device is practical for use on motors of almost any size. Such a device may be furnished with normally open or closed contacts for alarm or shutdown.

5. Gathering-Unit Control

Field pumps and gathering stations must be located near the producing wells. Since the amount of oil to be handled is not constant nor the producing life of a well definite, field and gathering units must be moved occasionally and new installations must often be made on short notice. It is important, therefore, that the electric-motor control equipment be designed for ease of installation and for interchangeability.

To meet the needs of the oil industry, the electric-control manufacturers have been building special equipment. This equipment generally consists of a single weatherproof sheet-metal enclosure containing a circuit breaker, a

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magnetic starter with overload protection, a lightning arrester, a hand-off-automatic selector switch, and a time switch. All equipment in the enclosure is prewired so that the field electrician need only hang the starter on a pole or other support and connect the motor leads and incoming power leads and ground the enclosure. Once these connections are made, the electrical installation is complete with short circuit, overload, and lightning protection and is provided with the necessary time switch for automatic control of the pump unit.

Additional protective devices . . . This equipment provides the essential requirements for most installations. It may be desirable to add additional protective or automatic devices. Pressure switches are available to protect against damage to the discharge line due to excessive pressures. Pressure switches are also available which will shut the unit down in the event of a drop in discharge pressure which is indicative of a line break. Float switches may be utilized to start and stop the unit as the oil height rises and falls in storage tanks. When these various protective devices are installed, precautions should be taken that any automatically reset devices are adjusted so that the unit does not go into a repeated starting and stopping cycle when the protective device functions. Automatic and supervisory control of field and gathering units has not been widely applied to date, but offers excellent possibilities. There are in use a few remote-control devices which utilize a selector switch which is responsive to a coded ring on a regular telephone circuit. The device may be used to stop or to start a motor or to connect a telephone transmitter for audibly monitoring unit operation.

As indicated by the preceding comments, no single type of motor or control can be definitely designated as the one most suitable for pipe-line use. The emphasis placed on low initial cost, low operating expense, safety, continuity of service, maintenance, appearance, remote operation, and various other properties will differ from station to station, and will affect the selection of equipment for a given installation. The author has merely attempted to briefly describe the merits of some of the types of equipment generally applied in the pipe-line industry.

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Light weight, easy handling mean fast installation of "Fibercast" pipe.

In more than two years of hard service, "Fibercast" reinforced thermosetting plastic pipe has solved long-standing problems of the petroleum industry in the handling of fluids such as sour crudes and salt water.

The pipe is made from BAKELITE Polyester Resins reinforced with glass fibers. The manufacturer, Fibercast Corporation, reports these advantages:

It resists rust, corrosion, chemical attack, and electrolytic action. It needs no coating, wrapping, or cathodic protection. Its smooth, non-corrosive surface minimizes paraffin build-up and provides greater flow, permitting the use of smaller pipe diameters than normally required. Flow is even, with settling, surge, and back pressure reduced.

The light weight of "Fibercast" pipe makes it easy to handle. For example, a 20-foot length of 3½ in. O.D. weighs only

REINFORCED PLASTIC PIPE

22.5 lb. This speeds installation. One company reported, "Ran 16 joints in one half hour...speeded up to one joint a minute in the afternoon."*

Other advantages of the reinforced plastic pipe include a high weight-strength ratio. "Fibercast" pipe won't shatter. It has about the same coefficient of thermal expansion as steel, and is a good thermal and electrical insulator. It needs no special installation machinery; can be readily cut with a hacksaw.

*Tulsa, Okla., Tribune, July 17, 1952

One man easily lifts a 20-foot length of "Fibercast" reinforced plastic pipe.

Photograph showing "Fibercast" pipe laid along irregular terrain.

"Fibercast" reinforced thermosetting plastic pipe is made by Fibercast Corporation, Sand Springs, Okla., and distributed by the Youngstown Steel Products Co., the Continental Supply Co., and the Youngstown Steel Products Co. of California. It is currently used for the handling of

Crude Oil • Salt Water • Mineral Salt Solutions Acid Muds • Gas • Gasoline • Dilute Acids and Alkalies • Hydrogen Sulphide

"Fibercast" pipe is made in 20-foot lengths. Outside diameters range from 2⅞ in. to 4½ in., with working pressures from 100-300 psi. Weights range from 17 to 54 pounds per section, depending upon wall thickness and diameter. Fittings and couplings are also made from BAKELITE Polyester reinforced thermosetting plastic, threaded or unthreaded, as desired. A permanent leakproof weld to the pipe is provided for threadless fittings by using "Weldfast" compound.

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TRADE-MARK
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BAKELITE COMPANY
A Division of
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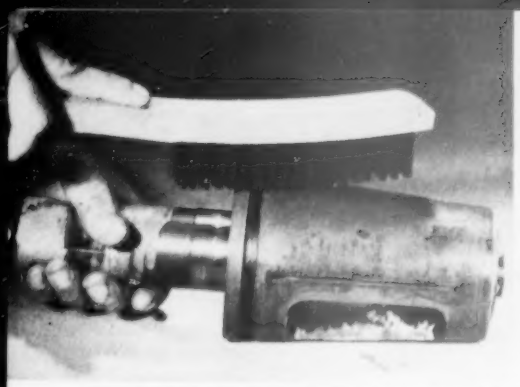


Wire brushing to remove deposits from corroded areas. Abrasive blasting might also be used.

Checking depth of lubricant groove is one step in valve examination.

What you ought to know about

Plug-Type Lubricated Valves

. . . their repair and reconditioning

by Robert H. Herring

A BASIC guide is given here for repair and reconditioning of plug-type lubricated valves. Such valves represent a substantial investment on the part of any company in the gas and petroleum industries. It would seem economical, therefore, for the valve user to spend a certain amount of money for the repair and reconditioning of valves that have seen substantial service. However, the question of whether a specific used valve justifies repair is an individual matter, and should be decided by a comparison of the probable repair and cost and the cost of purchasing a replacement.

All plug-type lubricated valves are usually worth reclaiming if their condition is such as to require only cleaning, inspection, and reassembly with new packing and gaskets. Possibly, a light relapping operation may be required to eliminate scaly deposits and superficial scoring or pitting.

However, judgment must be exercised in cases where the valve body may require reboring and fitting an oversize plug, or where building up of surfaces with weld metal is required. This type of work is not economically justified for low and medium-pressure valves. As a general rule, complete rebuilding of 4-in. and smaller 175-psi. working pressure or 2-in. and smaller 200, 400, 500, and 800-psi. working pressure semisteel valves should not be undertaken. The final decision to repair or not will depend upon the actual repair cost in terms of available equipment, labor, and overhead rates.

Author is chief engineer, Rockwell Valves, Inc., Rockwell Manufacturing Co.

Cleaning and Examination

After preliminary cleaning and complete disassembly of the valve, parts should be cleaned by using any suitable alkaline or solvent solution. Corroded areas may require wire brushing or abrasive blasting to remove deposits. Tapered seats of both body and plug should be carefully examined for corrosion, pitting, scoring, galling, or erosion. For plugs having integral shanks, the machined shank diameter and the adjacent shoulder on the plug should be similarly examined.

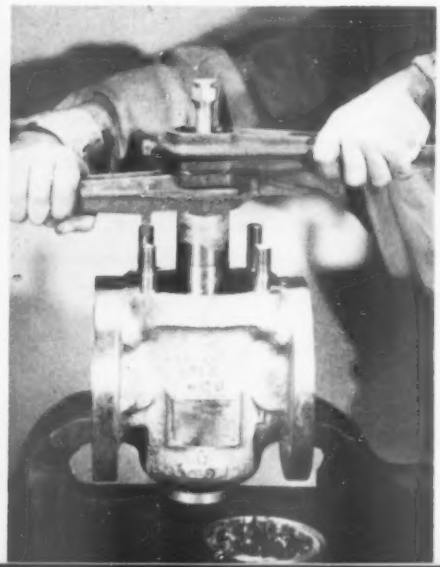
Repair procedures . . . These are determined by the extent and depth of

Checking taper with feeler stock. Valve bodies can be remachined.

Checking accuracy of fit by examining plug which has been blued, inserted into the body and rotated one or two turns under light pressure.

Applying lapping compound to bearing surface of plug.

Lapping valve by hand. This is final step in making close body-and-plug fit.



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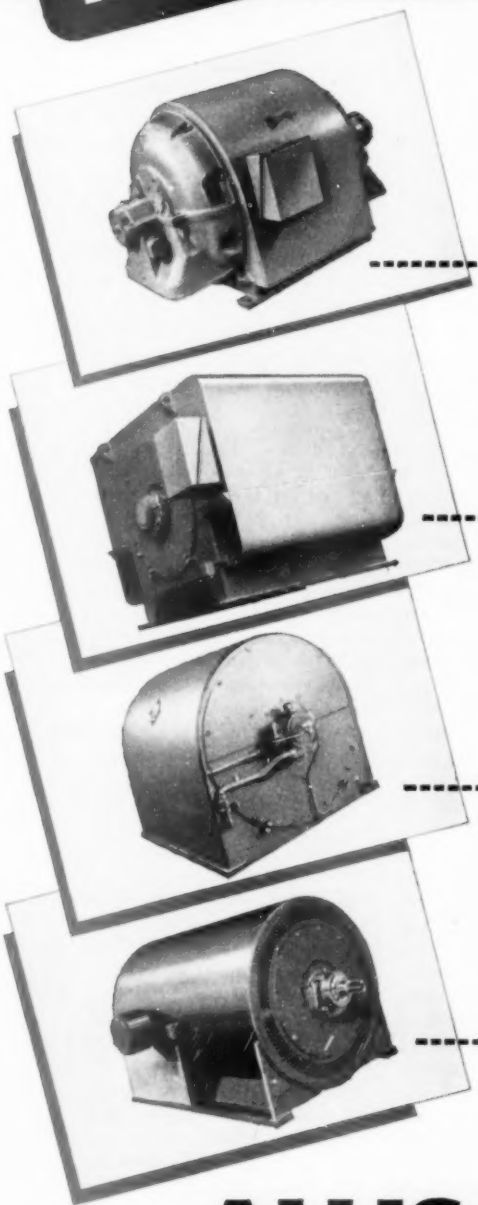
Because Allis-Chalmers builds a complete line of induction motors for the petroleum industry, you can select the exact degree of protection needed



Drip-Proof or Splash-Proof

In many cases, drip-proof or splash-proof motors can readily be used for refinery power-plant auxiliaries, crude oil pumping, and similar applications. Designs based on half a century of motor building experience assure dependability and durability. For detailed information, ask for Bulletins 05B7542 and 51B7693; for two-pole motors 900 hp and larger, get Bulletin 05B7550.

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Wherever open ventilation is permissible, weather-protected motors can be used. And they can be used outdoors in any kind of weather — rain, snow, sleet, or blowing dust and sand. Special tests with sand and water driven at 75 mph proved that these motors need no housing. Yet they cost little more than indoor splash-proof machines. Ask for Bulletin 05R7874.

Enclosed Forced-Ventilated

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For maximum motor protection, specify Allis-Chalmers *tube-type* TEFC or explosion-proof motors. They offer complete enclosure of electrical parts, self-cleaning action and full internal air circulation. Time-proved design permits ratings up to 3000 hp and larger. Underwriters' labels up to 800 hp at 3600 rpm. Ratings and construction details are given in Bulletins 51B7149 and 05B7150.

For more information or for engineering assistance, call in your nearby A-C representative. Or write for the descriptive bulletins listed above. Allis-Chalmers, Milwaukee 1, Wisconsin.

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blemishes in seating surfaces of both plug and body. The following are some typical cases:

Case 1—Corrosion or scoring is very shallow. Here the valve can be salvaged by relapping the plug in the body without machining seating surfaces of either the body or the plug. However, in the case of integral-shank plugs, the shank diameter and adjacent shoulder must be resurfaced by turning or grinding, before relapping.

Case 2—Corrosion, galling, or scoring of moderate depth. Remachining of the tapered seating surface in the body is necessary. This will usually require an oversize plug to match the oversizing of the taper bore.

Case 3—Severe corrosion, erosion, galling, and deep scoring. Rebuilding of the worn areas in the body is necessary to restore the tapered seating surface, before machining the valve bore. Rebuilding can be done by any approved process of welding or brazing.

Replacement plugs . . . Valve plugs are individually fitted and lapped to the bodies by the manufacturer. Therefore, replacement plugs are furnished oversize with a semifinished taper, to allow metal stock for fitting to rebored bodies. Most valve bodies are designed with extra metal thickness at the tapered section to permit one or more reboring operations without reducing wall thickness below allowable limits. Replacement plugs are generally furnished to standard oversize taper dimensions. However, plugs with greater oversize can, in most cases, be obtained on special order from the manufacturer.

Remachining Valve Bodies

An engine lathe or a vertical boring mill can be used for remachining valve bodies. In any case, the machine should have a suitable taper attachment or ram, capable of producing a taper angle of 4½° from the center line. In some cases, the body casting need only be set true to the original bore. In others it must also be aligned with the threaded plug-stem hole. Eccentricity of the alignment of the threaded plug-stem hole with the taper bore in the body should not exceed 0.005 in., otherwise a binding action will result between the plug stem, equalizer ring, and the tang on the plug after the valve is assembled.

Making cuts . . . A trial cut should be taken to check correctness of setup and taper angle. Sufficient initial cuts should be made to remove all blemishes. The finish cut should produce a clean, smooth, straight, and round bore. The final finish cut must be taken very lightly, and with a fine feed, in order to produce a true taper bore.

Proper adjustment . . . Accurate work cannot be obtained unless the spindle, tool carriage, and the machine ways are in good condition and properly adjusted to avoid "lash." These precautions are particularly important in finish-boring plug valve bodies because of the interrupted cut when the tool passes over port openings.

After the bore is machined, the lubricant grooves or ducts on the body should be checked. If any are missing or greatly reduced in depth, they should be reproduced by either chipping, machining, or grinding, and should be located in the same position as in the original bore.

Similarly, bodies which require rebuilding of worn areas prior to machining must have the lubricant grooves and ducts remachined. Dimensions and location should be taken from the body and accurately transferred to the remachined bore.

Machining Plugs to Fit Valves

1. Semisteel and bronze . . . Oversize plugs, as shipped, are centered and finish-machined except for the taper section. The plugs should be placed between centers in an accurate lathe with taper attachment set 4½° from center line. The taper should first be machined to caliper-and-scale dimensions taken from the valve body. However, sufficient metal should be allowed for final matching of taper and diameter.

After the plug is turned down to the point where it will enter well into the body seat—but not all the way—the taper should be checked very closely with strips of "feeler stock" placed between the plug and body near both ends of the taper. It may be necessary to repeat this procedure, taking light trial cuts and adjusting the lathe taper attachment each time, until an exact fit is obtained.

After the taper is exactly matched, further light cuts are taken until the plug enters the body with the plug shoulder below the body gasket seat a distance about equal to the "minimum" dimension allowed by the manufacturer. This will allow for a slight further "drop" of the plug in the final lapping operation — without exceeding manufacturer's "maximum" dimensions.

2. Steel . . . Plugs for steel valves require a hardening treatment between machining and lapping operations to prevent galling and seizing in the valve body. While steel replacement plugs can be heat-treated, they are furnished soft, to permit turning the taper to fit rebored bodies. Therefore, rebuilding of steel bodies should not be undertaken in the field unless suitable heat-treating and grinding equipment is available. While it is impossible to go into detailed heat-treating instructions, the following is the general sequence of operations for steel plugs.

The plug is turned to fit the body bore as described above for semisteel valves, except that an additional allowance of about 0.020-0.040 in., depending on size, must be left on the plug taper to permit grinding after heat treatment. The plug is heated, quenched, and drawn to produce a medium hardness on the taper surface. At the same time, however, it must retain sufficient ductility to avoid danger of breakage in service. Plugs with integral shanks should be quenched on end to keep warping at a minimum.

After hardening, plugs are finished by grinding between centers in an accurate external grinder built for taper work. In order to obtain accurate work, plugs should have centers trued before grinding is started. The procedure for matching taper and final position in the body is the same as in the case of semisteel plugs.

Lapping

The final step in producing an intimate fit between body and plug is the lapping of the respective bearing surfaces with abrasive compound. It should be noted that this step cannot be used to correct deficiencies in previous machine work. Excessive lapping will produce irregularities in seating surfaces and may cause the plug to fit too deeply in the valve body. This may result in mismatching of port openings and circular lubricant grooves.

If preliminary machine work has been done properly, it should be necessary to do only enough lapping to take out tool and grinding marks and produce a satin finish on the taper surface.

Before the lapping operation is started, all sharp edges of both body and plug should be deburred with either a file or emery cloth, and bearing surfaces should be cleaned and free of any dirt or metal particles.

Valves may be lapped by hand or with an upright drill press. If the latter is used, the valve body should be secured to either the table or the base and the plug rotated through a floating attachment connected to the spindle. Sufficient "float" must be provided to prevent the plug from lapping out of round in the body.

For smaller size valves, additional weight on the plug may be required to provide sufficient pressure between plug

and body during the lapping operation. On the other hand, for larger valves, it may be necessary to counterbalance part of the plug weight in order to prevent excessive pressure between the plug and valve body.

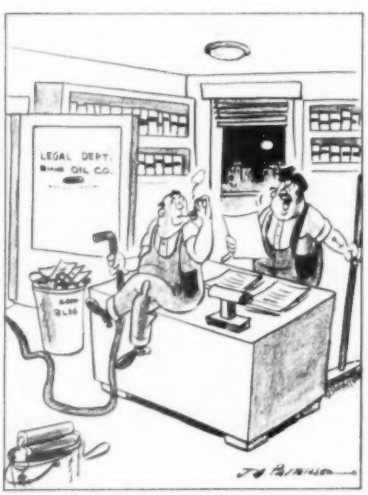
The lapping compound may consist of a 220-grit aluminum oxide for steel, or a 200-grit silicon carbide for iron valves. The grit is suspended on a non-lubricating-oil emulsion.

During the lapping operation the plug should be lifted approximately ¼ to ½ in. out of the body, depending upon the plug size and lapping compound consistency, after each four or five revolutions. In any case, sufficient space should be provided between the plug and body to permit the lapping compound to spread evenly and produce a uniform action.

Lapping is continued until all machining marks disappear and the surface shows a uniform matt finish. Rotation of the plug in the body should now show an even metal-to-metal contact, without excessive bright or dark areas. The accuracy of the fit can be checked by bluing the plug into the body and rotating it one or two turns under light pressure. Any mismatching, offtaper, or out-of-roundness will show clearly when the plug is removed and examined.

The same requirements as indicated for lapping with a drill press hold true for hand lapping. In the latter case, however, the plug is usually oscillated four or five times between each lifting of the plug out of the body.

After the lapping is completed, the depth of the plug in the body should be checked against manufacturer's specifications.



"Whew—get a load of this poor legal phrasing — misspelled words — Brother, this thing would never stand up in court."

Here's the key—

TO A "FREE" TUBING STRING

SAME O. D. AS TUBING COUPLING
LEFT-HAND SQUARE THREADS RELEASE EASILY AND POSITIVELY
OIL-RESISTANT THREAD SEAL
"FULL-BORE" SAME I. D. AS TUBING
Product No. 441

You need never worry about freeing your tubing from packers and other devices that sometimes freeze in the hole after prolonged periods of use—not if you've taken the precaution to install a Baker Safety Joint strategically in your tubing string.

BAKER SAFETY JOINT

A few turns to the right unscrews the Baker Safety Joint, freeing your tubing quickly and easily. And you just don't worry about the Baker Safety Joint ever freezing or sticking. It is especially designed to unscrew easily even after long periods of sub-surface exposure.

Precision-matched *left-hand* square threads are of the exact tolerance and taper to ensure positive breaking of the joint. The tough, oil-resistant thread seal effectively protects these threads from corrosive fluids.

YOUR SUPPLY STORE has BAKER SAFETY JOINTS in stock, or will get them for you promptly.

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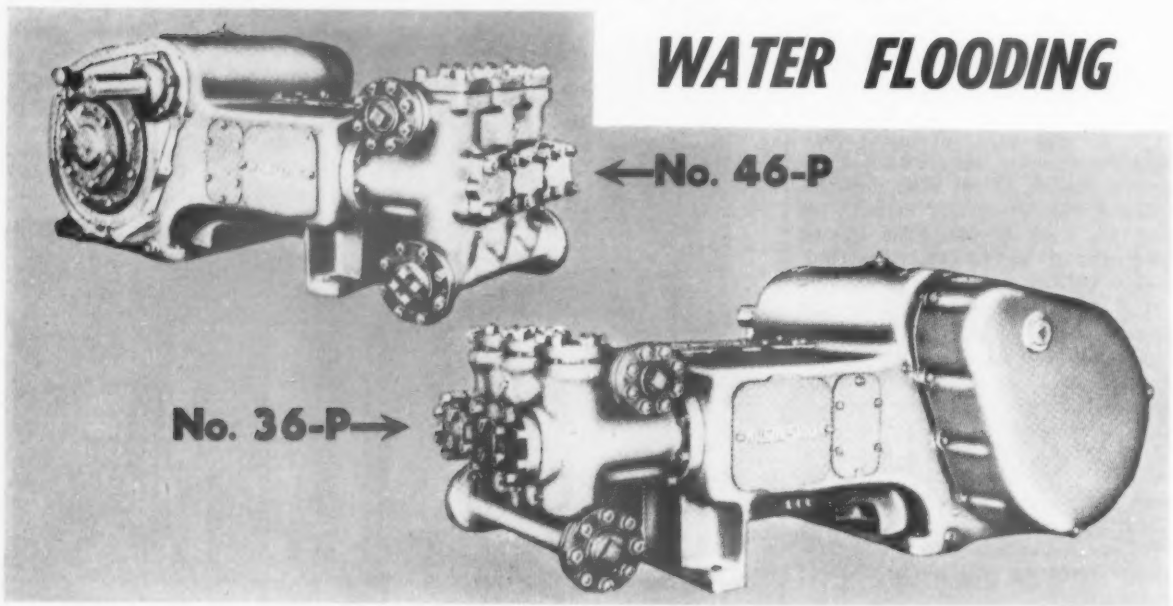
HERE ARE TWO WILSON-SNYDER TRIPLEX PLUNGER PUMPS PROVEN SUPERIOR FOR—

WATER FLOODING



Where a change from medium to high-pressure fluid handling is foreseen, as in water-flooding operations, the operator can convert his medium pressure No. 46-P pump to pump at higher pressures by exchanging his No. 46-P fluid end for a No. 36-P fluid end. Thus, the interchangeable fluid ends of the two pumps permit one power end to serve throughout a water-flooding project.

The No. 36-P and No. 46-P Triplex Plunger Power Pumps are heavy-duty, horizontal, three-cylinder, single-acting pumps for pumping water, oil, acid or similar non-abrasive liquids at high pressure and in a wide capacity range. A combination oilbath and force-feed lubrication system assures an ample supply of oil to all working parts. Diaphragm stuffing boxes and fluid-end stuffing boxes are force-feed oil or pressure grease-lubricated. All service points are readily accessible. One piece, direct flow fluid end assures minimum restriction to flow. Various types of plungers are surface-hardened for wear resistance. To change from one size plunger to another, it is only necessary to install new stuffing box gland bushings, packing, and lantern rings. Manganese-bronze fluid valves and seats are of the wing-guided type. For special service applications, stainless-steel valves and seats of the same type can be furnished.

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Preparing Preliminary Job Estimates

(Continued from page 107)

which is quickly calculated, and the weight of the empty vessel previously obtained are the only determinates required. Therefore a minimum of time is required to find the volume of concrete required for the foundation.

Foundations for exchangers may be estimated from a graph such as shown in Fig. 8.

Other similar charts and methods are used to rapidly compute material and labor costs of other components.

6. Other costs . . . To the summation of the direct costs obtained, the miscellaneous costs which have not been included up to this point are added to the estimate. These costs cover:

(a) From 9 to 11 per cent for miscellaneous direct costs which include freight and cartage, rigging, testing, cleanup, supplies, temporary structures, insurance, taxes, etc.

(b) From 25 to 35 per cent for miscellaneous indirect costs which include contractor's fees, engineering, etc.

Comparison With Existing Equipment

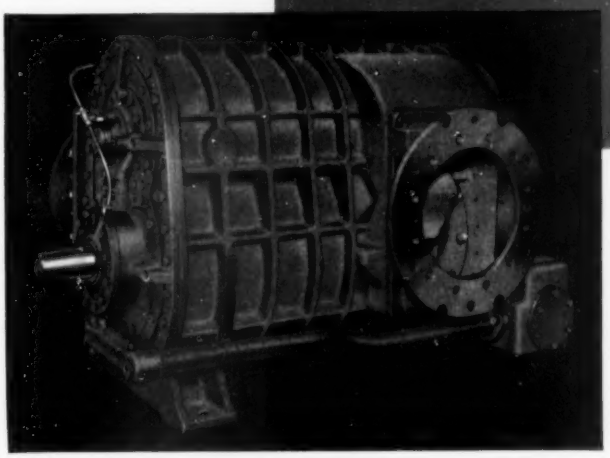
Another estimating method, often used and less rigorous, produces short-cut answers directly. When process-design flow sheets are not available, or less nearly accurate estimates suffice, the cost of proposed equipment can often be approximated by comparison with existing equipment: (1) The cost of the existing equipment is first corrected for any known design variations by the methods aforementioned; (2) the cost is then adjusted for differences in the price level of materials and wages, and finally, (3) the cost is adjusted for variation in size of the unit or its components by application of exponential factors.

This exponential theory, with which many are familiar, states that over a limited range the cost of a unit or item of equipment varies as a fixed power of its size. Accordingly, a curve drawn with the cost plotted against size on a log-log graph appears as a straight line. The exchanger cost curve given in Fig. 1 is such a curve. Exponents for various processing units, based on charge flow or product flow, range from 0.35 to 0.80. *(The Oil and Gas Journal, October 5, 1950.)*

Accuracy . . . This will vary for the cost estimates as prepared by the methods described herein, with the detail of preparation and the extent of the design information made available to the engineer. However, an accuracy of

STANDARDAIRE BLOWERS take the SHOCK out of compression

The Standardaire Axial Flow Positive Displacement Blower



Standardaire Axial Flow Positive Displacement Blowers operate on a principle of compression unlike any other blowers. Their symmetrically generated rotors act as an air screw, drawing in and discharging air smoothly from the pockets which form between them.

Compression is gradual, completely internal and free from shock. Internal pressure is raised to equal discharge pressure before the pocket registers with the discharge port, eliminating the slap back and loading of internal parts common to many types of blowers.

Standardaire Blowers move more air, with less wear, less maintenance and power cost than any blowers of equal weight, size or comparable design.

For further information, write:

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"THE BRAND OF PROGRESS"

By Heat Exchanger Specialists

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But both the Southwest and Western Supply expanded as the vast oil fields of the area were discovered and opened for production. This expansion gave birth to the vital need for machines and craftsmen to manufacture refinery equipment for processing the new-found oil. It was this condition in 1936 which channeled Western's facilities toward the manufacture of heat transfer equipment.

Today, Western is counted as one of the primary manufacturers of all types of heat exchangers. The big Western "W" can be seen in the largest plants of the Petroleum, Chemical and Petro-Chemical industries — ample testimony to Western's ability to keep pace with these rapidly expanding fields.

An advertising series titled, "The Brand of Progress" will present the reasons behind the growth of Western Supply Company. Follow this series in this magazine.

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HEAT EXCHANGERS
Manufactured by
WESTERN SUPPLY COMPANY
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TEMA

20 per cent is obtainable with reasonable care and judgment, and often the accuracy obtained is within 10 per cent.

Good Judgment Required

The preliminary estimate may be defined as a cost estimate which is prepared with the benefit of a minimum of process and mechanical design data.

Most preliminary estimates must be prepared in the shortest possible time without the opportunity of thoroughly investigating alternative mechanical designs. Consequently, good judgment is required on the part of the engineer to visualize the complete plant and select and price the required equipment. There is no substitute for experience in cost estimating any more than there is in any other effort to look ahead and predict what is going to happen.

Value of Preliminary Estimates

The ultimate purpose of a cost estimate is to provide management with the information it needs to allocate expenditures in a manner that will provide the maximum return with due consideration to the safety of personnel and the original capital investment.

Development estimates . . . An important part of the work of research departments concerns the development of new and improved manufacturing processes. The course and effectiveness of this work is greatly influenced by the extent to which the many problems involved in placing a new or improved process in operation on commercial scale are visualized and resolved at an early stage. Cost estimates are usually required to assist in solving these problems.

Pilot plants . . . Frequently relatively large-scale pilot plants for studying the manufacture of new products are so expensive that an economic study of a full-scale plant is needed to justify the over-all expenditures required to develop the process.

For these reasons, the preliminary cost estimate is invaluable to management. The estimate is prepared with the expenditure of a fraction of the time and expense required for the usual detail estimate. Formal quotations need not be obtained and all process and mechanical design details need not be known. Detailed takeoff of materials such as piping, structural steel, instruments, electrical wiring, etc., is not made. Thus, by using preliminary estimates research and planning can proceed rapidly to a conclusion. Alternative process designs can be compared quickly.

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THE OHIO INJECTOR COMPANY
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OIC Valves, Bronze, Iron, Cast and Forged Steel for all purposes

OIL STATES EQUIPMENT COMPANY
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STEEL FORGINGS, Inc.
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VOLCANO BURNER COMPANY
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Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

WESTERN SAFETY BARREL STAND
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Stand lifts, holds, tilts 55 gal. barrels. Prevents spillage—easily loaded.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

Predicting Water-Flood Behavior

These sample calculations are made using the charts of Muskat's, "The Effect of Permeability Stratification in Complete Water-Drive Systems," to predict the history of a water flood.

Reservoir data:

Area, acres	1,600
Average net thickness, feet	25
Bulk volume, acre-feet	40,000
	31×10^6 bbl.
Porosity	0.29
Net volume, bbl.	8.99×10^6
Connate water	0.33
Original oil saturation	0.67
Original oil formation volume factor, res. bbl./bbl. stock-tank oil	1.25

Stock-tank oil in place:

$$\frac{8.99 \times 10^6 \times 0.67}{1.25} = 4.82 \times 10^6 \text{ bbl.}$$

Cumulative production before flood, bbl.	1.02×10^6
Oil in place before flood, bbl.	3.80×10^6
Formation volume factor, res. bbl./bbl. stock-tank oil	1.08

Oil saturation before flood

$$\frac{3.80 \times 10^6 \times 1.08}{8.99 \times 10^6} = 0.457$$

Cores arranged in order of increasing permeability:

Cumulative number	Air permeability (md.)
1	7.1
2	11.1
3	13.9
4	26.1
5	38.0
6	46.0
7	60.1
8	112
9	155
10	262
	731.3
Arithmetic average	73.13

$$K = K_{\text{arithmetic}}\, e^{b\,Z/H}$$

From Fig. 1

When $Z = 0$ ft., $K = 4.8$

$Z = 5.81$ ft., $K = 48.0$

$$48.0/4.8 = e^{b\,5.81/10}$$

$$10 = e^{0.581\,b}$$

$$\ln 10 = 0.581\,b$$

$$b = 2.303/0.581$$

$$b = 3.96$$

Exponential permeability variation:

$$r = e^b = e^{3.96} = 52.52$$

Summary of flood-pot data:

Air permeability, md.	180
Porosity	0.28
Initial saturations	
Gas	0.25
Oil	0.43
Water	0.32
	1.00
Final saturations	
Gas	0.12
Oil	0.23
Water	0.65
	1.00
Oil permeability in the oil bank, md.	0.57
Water permeability in the flooded-out region, md.	0.057

$$K_o/K_w = 0.57/0.057 = 10$$

Oil recovery as a fraction of that in place before flooding:

$$\frac{0.43 - 0.23}{0.43} = 0.465$$

Reservoir oil viscosity, cp.	3.5
Reservoir water viscosity, cp.	0.8

Mobility ratio (**m**)

$$0.57/0.057 \times 0.80/3.5 = 2.28$$

Reservoir volume of oil in place before flood:

$3.80 \times 10^6 \times 1.08 = 4.10 \times 10^6$ reservoir barrels.

Areal sweep	0.50
Recovery factor from flood pot	0.46

Displaceable oil:

$4.10 \times 10^6 \times 0.465 \times 0.50 = 953 \times 10^3$ reservoir barrels.

Estimation of water required for fillup:

From the flood-pot data:

Gas saturation before flood	0.25
Gas saturation after flood	0.12
	0.13
Reservoir volume, bbl.	8.99×10^6
Sweep efficiency	0.50

Water for fillup:

$8.99 \times 10^6 \times 0.13 \times 0.50 = 584 \times 10^3$ barrels.

TABLE 1

(1) Water cut	(2) 1 — c	(3) m = 0.1	(4) m = 1.0	(5) m = 2.28	(6) m = 10.0
0.20	0.80	0.19	0.34	0.40	0.50
0.40	0.60	0.22	0.41	0.47	0.58
0.60	0.40	0.25	0.51	0.58	0.67
0.80	0.20	0.33	0.67	0.72	0.80
0.90	0.10	0.44	0.80	0.84	0.88
0.0	0.100	0.18	0.28	0.33	0.44

Columns 4 and 6 from Figs. 2 and 3 for a permeability variation, r = 52.52. Column 3 from a similar chart not shown. Column 5 by interpolation.

TABLE 2

(1)	(2) Oil recovered	(3) Oil recovered	(4) Cumulative water injection (after fillup)	(5) Cumulative water injection (after fillup)	(6) Cumulative water injection (after fillup)
Water cut (%)	Reservoir fraction	Thousands of stock tank barrels	Fraction of displaceable oil	Thousands of barrels	Total thousands of barrels
0.0	0.33	291	0.330	314	898
20.0	0.40	353	0.408	389	973
40.0	0.47	415	0.508	484	1,068
60.0	0.58	512	0.728	694	1,278
80.0	0.72	635	1.195	1,139	1,723
90.0	0.84	741	1.995	1,901	2,485

Column 1 = Column 1 Table 1

Column 2 = Column 5 Table 1

Column 3 = Column 2 $\times \frac{953 \times 10^3 \text{ reservoir barrels}}{1.08 \text{ reservoir bbl./bbl. stock-tank oil}}$ = Column 2 $\times$ 882.4 $\times 10^3$ barrels.

Column 4 = Preceding item plus the differences in Column 2 $\div$ (one average water cut).

Column 5 = Column 4 $\times$ 953 $\times 10^3$ barrels.

Column 6 = Column 5 + 584 $\times 10^3$ barrels.

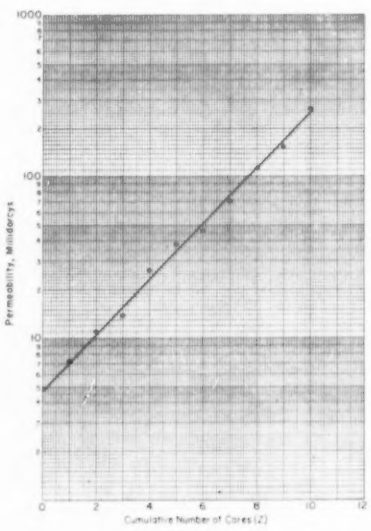
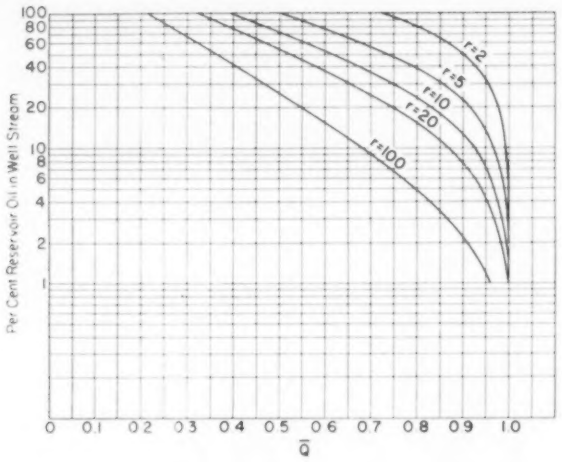
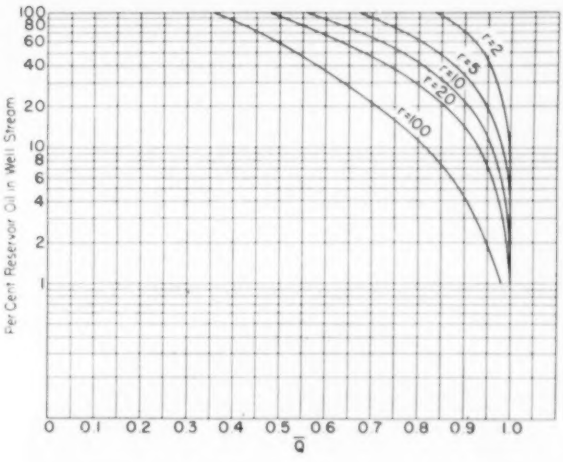


Fig. 1



THE VARIATION OF THE OIL CONTENT IN THE PRODUCTION FROM EXPONENTIALLY STRATIFIED WATER-DRIVE RESERVOIRS WITH THE CUMULATIVE RECOVERY, FOR $\bar{m} = 1$; $\bar{Q}$ = CUMULATIVE RECOVERY, AS A FRACTION OF THE TOTAL RESERVOIR DISPLACEABLE RECOVERY. r = STRATIFICATION RATIO; $\bar{m}$ = (MOBILITY OF DISPLACED OIL)/(MOBILITY OF INVADING WATER).

Fig. 2 (After Muskat)



THE VARIATION OF THE OIL CONTENT IN THE PRODUCTION FROM EXPONENTIALLY STRATIFIED WATER-DRIVE RESERVOIRS WITH THE CUMULATIVE RECOVERY, FOR $\bar{m} = 10$; $\bar{Q}$ = CUMULATIVE RECOVERY, AS A FRACTION OF THE TOTAL RESERVOIR DISPLACEABLE RECOVERY. r = STRATIFICATION RATIO; $\bar{m}$ = (MOBILITY OF DISPLACED OIL)/(MOBILITY OF INVADING WATER).

Fig. 3 (After Muskat)

WHAT'S THE PAYOUT . . .

. . . on that secondary-recovery project?

Here are the criteria, and some calculations to help in answering this question

by George Hetherington

THE three criteria used to predict the economic feasibility of any proposed secondary recovery project are:

- Does there exist a sufficient quantity of recoverable oil?
- Is there available an adequate supply of satisfactory injection fluid?
- Will the displacement of the oil by the injection fluid proceed in a satisfactory manner?

If there is an existing project in a closely similar reservoir, judgment may be based on its behavior. If not, it must be indicated that the reservoir lends itself to the displacement of a sufficient quantity of the oil it contains.

For predicting the behavior of a water flood, a calculation method with supporting calculations has been included.

Author with Gulf Oil Corp., Pittsburgh production department. Paper presented at Gulf Production Engineering Conference, Pittsburgh, 1953.

Water Flooding

No method of secondary recovery so far tried or publicly proposed, short of actual mining of the sand, is applicable to reservoirs already swept by water. Therefore, any well, lease, or field which approaches the economic limit of profitable production with a high water cut can be dismissed as a possible project for secondary recovery.

The exception to this is the case where there are several producing formations opened by common completions to the same wells. Water may have naturally flushed some of the reservoirs while others have been little affected by it. Different parts of the same reservoir may also have been in markedly varying degrees swept by the encroaching water. The redevelopment of such a field for secondary recovery is a difficult problem, which has seldom been attempted.

The possibility that water produced with the oil in any given well may be entering by leakage of the casing or casing cement must also be considered. When there is no reasonable doubt that most of the formation has been subjected to active flushing by the natural encroachment of water and the wells approach abandonment producing relatively large volumes of water, additional oil recovery by any method presently known to be practical is not to be expected.

There is sometimes a tendency to assume that nearly any field which did not have an active natural water-drive can be successfully water flooded. Unfortunately this is far from true. Many water floods have been physical failures, the injection of the water resulting in little or no additional recovery. Many more have substantially increased the oil recovery, but not sufficiently to pay for the cost of secondary development and operation.

Shaw[1] presents a table which is near-

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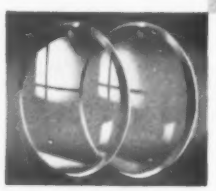

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ly complete to the end of 1949, for fields flooded in Oklahoma outside the Nowata area. Out of 38 projects, 7 had been abandoned without adding appreciably to the oil recovery. The recovery on that date for at least five more suggests that they too would be abandoned without yielding more than a very small amount of oil. The same author[2] lists 24 projects in North Texas, of which 1 was definitely abandoned as a failure, and 5 more appear to have produced so little oil that they will probably mean a financial loss for the operators.

Recoveries in these fields varied from a project abandoned with a water-flood recovery of less than ½ bbl. per acre-foot of reservoir to one still in operation after having yielded 411 bbl. per acre-foot. In the Nowata area of Oklahoma, all of 35 projects appear to have been successful.

When either water or gas is injected while the field still has a substantial primary recovery the result can only be evaluated by comparison with the projected performance without fluid injection. The whole operation will often be profitable no matter how it is handled. Only on the basis of a study of the reservoir and a forecast of its behavior under programs of operation different from that actually employed can it be said that some other procedure would not have been more profitable.

The same field cannot be produced twice in two different ways.

Evaluation by Comparison With Other Projects

A familiar and simple estimate of primary oil recovery is based on the assumption that recovery per acre will be the same as the recovery per acre from some similar field. The assumption is valid to the extent that the two fields are actually nearly identical in formation thickness, original characteristics of the reservoir and its contained fluids, and, to the extent that the recovery is affected thereby, that the fields will be operated in a closely similar manner.

In many cases where much of the oil will be recovered by operating with a small margin between the value of the production and operating costs, the price at which the oil is sold will in a large measure determine the recovery and the assumption of equal recovery for the two fields implies the assumption of the same oil price in the last part of the producing life of both fields.

The same kind of reasoning can be applied to secondary recovery; and is valid to the extent that the two fields or two properties are actually similar in all significant respects, and that an essentially identical secondary-recovery process will be applied to both. Even a pilot water-flood or gas-injection program is a valid criterion of the probable success of a more extensive operation in the same field, only to the extent that the area of the pilot operation and the conditions of its operation are representative of the larger area.

By assuming for the project under consideration the same added recovery per acre-foot as in some other field or area where secondary recovery has been applied, differences in the pay thickness are taken into account, but essential similarity in other properties of the formation and its fluids again are assumed.

Comparison with other projects on an acre or acre-foot basis are sometimes the only feasible methods of appraisal which can be applied. They are always valuable as checks on the predictions by more elaborate methods. As items in a report they are considerably more convincing when the behavior of the project or field used for comparison is given in some detail and the evidence presented for believing that the project under consideration is similar.

Mechanism of Water Flooding

In very nearly all commercial oil reservoirs in their original condition, the connate-water saturation in the sand, except in the immediate vicinity of the water table, is such that there is a negligibly small effective permeability to water. The first wells, unless they penetrate or approach the water table, produce "clean" oil. The restored-state method of determining the original water depends on the assumption that water saturation will be just that for which the water permeability is zero. If there has been no water drive, then this is still true when water flooding begins.

Buckley and Leverette[3] have discussed the mechanism by which displacement of the oil occurs. The water saturation rises as the water displaces oil, the permeability to water rises and the permeability to oil falls. The theoretically recoverable oil is that represented by the difference in oil saturation when flooding begins and the oil saturation when the oil permeability approaches zero. In actual operations the water cut becomes too high for profitable operation much before the oil permeability vanishes.

According to Dickey and Bossler,[4] it is suggested that "economic recovery of oil by secondary water flood can occur only when a rich bank of oil is formed by the encroaching water." This oil bank, which causes the capacity of the producing wells to rise before they begin to produce much, if any, water is characteristic of practically all successful water floods.

Use of Reservoir Data

The familiar flood-pot test, which should start with the sample containing the same fluid saturations as the reservoir before flooding, determines the magnitude of this bank and the history of the oil-water ratio after the production of water begins. The viscosity of the oil should be as nearly as possible what it would have been in the reservoir. The higher reservoir temperature and remaining dissolved gas in the reservoir oil may make the viscosity materially different from that of stock-tank oil at the surface.

Cores are sometimes taken before initiating the water flood or in the first of any wells drilled for the water flood, a principal objective being to determine the remaining oil saturation. As in all coring it is quite unlikely that the fluid content of the cores as they reach the surface are directly representative of saturations in the reservoir. The exception to this generality may be the water saturation of samples taken from near the center of cores taken with oil or oil-based mud.

An estimate from the original oil in place and the cumulative recovery will often be the only available indication of the remaining oil and the oil saturation and will always be useful as a check on any data from core analysis. In Pennsylvania, and sometimes in other areas, considerable importance is attached to the observed fluid saturations in chip cores obtained with cable tools. Because of their size they present some problems in laboratory techniques, and there is no reason to suppose that even with negligible flushing by a drilling fluid, cores could be brought to the surface from a reservoir still having some pressure without losing some of the oil it contained when in the ground.

The gas saturation in reservoirs approaching depletion by gas drive alone can usually be assumed to be about 25 per cent.

Mobility ratio . . . The mobility ratio can be readily calculated if the fluid saturations, fluid viscosities, and relative permeability are known. For most secondary-recovery projects such data will not be available nor will the coring, fluid sampling, and other operations necessary for obtaining it be at all feasible. But it will often be possible to show that for all reasonable assumed values, an oil bank is probable and that sufficient recoverable oil is present to pay out the proposed development. If other known conditions are not unfavorable, this alone should justify an

attempt to flood small properties, minority participation in a unitized project, or a pilot project.

The flood-pot test is a direct measurement of the ability of the water to form an oil bank, of the oil-water ratios after the water has broken through and until the oil permeability approaches zero, and of the residual oil after flooding. Experimental difficulties probably seriously limit its precise validity, and no significance can be attached to the indicated recovery unless the core at the beginning of the test has fluid saturations representative of the reservoir before flooding.

Considering the general nonuniformity of oil reservoirs, it is apparent that many tests would be required to obtain a reasonably valid representation of the reservoir as a whole.

The development of an oil bank and a sufficient volume of oil recoverable from each unit of the pay before the oil permeability vanishes is a necessary but by no means a sufficient condition for a successful water flood. If the water can readily channel through from the injection to the producing wells leaving much of the reservoir untouched, the project will fail even though the inherent recovery from small elements of the sand is high.

Permeability profiles are used with the data from the flood pot or calculated on the recovery from individual reservoir units to predict the history of the water flood.[5 6 7] In these methods an abrupt transition in each layer between the area in which only the residual oil remains and that in which the oil permeability is at its maximum is assured.

Cumulative recovery . . . By the method of Parsons and Dykstra[8] and the use of their charts cumulative oil recovery to water oil ratios of 1 and 25 can be estimated. Their development also assumes a sharp front for the flooded-out area in individual layers, but does take into account the differences in the mobility of the oil and water, and, with same assumptions, Muskat's[9] more general charts can be used in the same way although they are presented by the author as theoretically valid only for water drive in sands fully liquid saturated.

These methods involve the assumption that the reservoirs consist of a series of layers of the uniform permeability of one of the cores, and neglect crossflow of the fluids between these layers. Measurements of the flow of water in injection wells[10] show that, in some cases at least, the rates of flow cannot be closely correlated with the permeability profile along a single well.

Moreover, close correlations between the permeability profiles of adjacent wells seem to be the exception rather than the rule, and it is reasonable to suppose that horizontal variations in the permeability of each interval and crossflow will tend to make the reservoir behave more like a uniform, homogeneous body than the variations along the bore of the wells would suggest.

Permeability variation . . . The magnitude of the permeability variation, by a standard definition, calculated from the core data available should be recorded. And a calculation of predicted behavior using the variation would be expected as a part of the detailed investigation of a major project, even when many of the data must be assumed. It is probably of more practical importance to examine the well logs and coregraphs for evidence of fairly large stratigraphic members of materially greater or less permeability than the average of the reservoir, which persist from well to well. Any direct evidence of fracturing in the cores themselves or references to them in the core description should be noted.

High well productivity indexes or high productive capacities not consistent with formation permeability are usually evidence of fracturing. Many of the most attractive water-flood prospects will be in fields where only a minimum of information was collected during the original development. Possible presence of streaks of high-permeability sand, fractures, or other avenues for water channeling, whose presence is not indicated by any available information, are a serious and often unavoidable risk in many water-flooding projects.

For a successful water flood it is not only necessary for the reservoir to contain a sufficient quantity of oil which can be displaced by water and to be free from conditions which promote excessive bypassing of the water; it must be possible to inject the water and produce the oil at economically profitable rates.

Water rates . . . Methods for estimating the rates at which injection wells will take water have been given by many authors.[11 12] Their application depends on data which is often unavailable. The capacities of the producing wells originally and before the water flooding is started indicate at least the order of magnitude of the capacities of the injection wells.

The total rate at which the flooding can be carried through is a function of the well spacing, the inherent capacity of each well, and the pressure applied at the surface. The pressure is in some measure controllable by the operator and may be increased after the flood is started. Pressure at the sand face cannot be raised beyond the pressure created by the weight of the overburden without danger of rupturing the formation and providing a channel for bypassing. The maximum safe pressure is usually taken to be 1 psi. per foot of depth.

Several authors have reported laboratory results that indicate that the oil recovery is increased by maintaining a high pressure gradient, though there is no general agreement on this point.

The pressure, the input-well capacities, and the spacing together determine the rate at which the field can be flooded. A flood which cannot be completed in 10 years or less will usually not have a satisfactory payout of the investment nor an attractive profit after discounting for present value. In very shallow fields and most fields developed many years ago, it is generally customary to either drill all new wells or at least to drill many infills.

On some properties in Bradford field, which has a relatively low permeability, the distance between producing and injection wells is as little as 150 ft., with 225 ft. to 250 ft. the usual spacing. In more permeable reservoirs such close spacing is not required, and at greater depths the cost of development on such a scale would often be prohibitive.

The economic feasibility of many water-flood projects will depend on whether they can be flooded in a reasonable time wholly, or chiefly with the existing wells. Formulas for calculating the areal coverage are given by Muskat.[13] The areal coverage for a single homogeneous layer must be corrected to allow for the variation in permeability.

Water supply . . . An adequate supply of water at a reasonable cost is, of course, a necessity in water flooding. And the cost of treating must not be excessive. Many oil sands contain hydratable clays. Fresh water or water much different in salinity from the connate water cannot be introduced without plugging the sand. In areas where this condition is common, a critical factor in appraising a possible water flood would be to show that a supply of water can be found of such character that it can be safely introduced into the reservoir. Laboratory tests of the effect of the water on at least a few cores is a must where this condition is known or suspected.

Flood forecasts . . . From the estimates of recoverable oil and rates at which the water can be injected, a forecast of the probable history of the water flood can be made. And from this, and the projection of the remaining recov-

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ery by natural drive, the economic advantages of the proposed water flood can be appraised. Possible projects will differ widely not only in the best value of the probable return on the investment, but also in the probable error in the estimate.

Reports dealing with proposed water floods should always give the basis by which the factors, particularly the recoverable oil, in the economic analysis were estimated. Successful and highly profitable secondary recovery operations have been started with little more information than the knowledge that oil was being produced or had been produced, with little water, from the area in question and the approximate depth at which the production was encountered. When the possible profit is sufficiently high, such projects may be attractive, but they should not be confused with proposals where good data and careful study have reduced the probable error in the estimated economic gain to a minimum.

Secondary Recovery With Gas

The inherent recovery obtainable from nearly depleted reservoirs with gas injection is so low compared with water flooding that it is seldom applied when water flooding is feasible, or is used only as intermediate steps between primary production and water injection. The investment involved in initiating gas injection is relatively small, and it has often been tried with little attempt to determine in advance the probable results.

The conservation for future use of gas that would otherwise be wasted or sold at unfavorable prices is often a consideration. Present high and rising prices for gas in most areas are tending to make it less attractive economically.

There are some reservoirs, however, that could not be successfully water flooded from which much oil can be obtained by low-pressure gas sweep. If the connate-water saturation is high, and the primary recovery process has produced a comparatively low gas saturation, and the oil reservoir viscosity is not too high, secondary recovery by gas injection will probably be feasible. Continuity and reasonable uniformity are desirable as in water flooding, but, since the bypassing gas does not have to be pumped from the producing wells, gas injection may be feasible in reservoirs where excessive breakthrough would make water flooding economically unsound.

If gas, which would otherwise be flared or sold at nominal prices, is available, the relatively small and largely salvable investments for the equipment to return it to the reservoir can be justified even though there is a large factor of uncertainty in the estimate of additional oil recovery. And the gasoline and light hydrocarbons picked up by stripped gas in passing through the reservoir is sometimes an important source of added income.

Secondary Recovery by Gas

The increased oil recoverable by gas injection in fields without gravity drainage could be calculated by the familiar Tarner[14] or Babson[15] method or Muskat's[16] equivalent differential equations. There do not seem to be any comparison of recoveries estimated by this method with actual gas injection in a nearly depleted reservoir. There probably are few, if any, reservoirs approaching depletion where all of the data, including the permeability-saturation relationship, necessary for its application would be available. Simplified methods of applying the same principles have been developed.

Day and Yuster[17] observed that the cumulative recovery of oil from cores was a linear function of the logarithm of the volume of gas passed through. Muskat[18] shows that this results from the fact that the log of the ratio of the relative permeability to gas to the relative permeability to oil is nearly a linear function of the oil saturation in the range applicable to fields nearly depleted by primary production. It is then shown that rate of oil production is a linear function of gas volume (or time for a constant rate of gas injection).

After injection has been started, the plot of oil-production rate against time can be extrapolated to the economic limit to obtain the cumulative recovery. For a limited number of cases a nearly linear relationship between production and the time for gas injection at a constant rate was observed and the cumulative recoveries by this method agreed very well with those actually obtained.[19]

Economic limit . . . The economic limit in gas injection is determined less by the rate of production per well than by the producing gas-oil ratio, and the cost of collecting and reinjecting the gas. If the reservoir were uniform and the relationship between the oil saturation and the relative permeability to gas and oil were known, the recovery by gas injection could be calculated from the difference in oil saturation when the gas injection is started and that at which the ratio becomes so high that oil production will not pay for the cost of returning the gas.

If the size and original condition of the reservoir are known or can be estimated, the condition at the time of the proposed injection project can be approximated from the production history. And there is practically no item entering into an estimate of the original oil in place, except the size of the reservoir itself and the original oil gravity and gas-oil ratio, for which a fair value cannot be obtained by the use of published data.[20] Deducting the cumulative production gives the remaining oil, from which present oil saturation may be estimated.

A fair curve of the ratios of relative permeability to gas and oil as a function of oil (or total liquid) saturation may often be constructed from the field behavior. As the end of primary production is approaching, the log of the relative permeability ratio is nearly a linear function of the saturation and the last part of this curve can be obtained by extrapolation. The saturation at the economic limit of the gas-oil ratio can be obtained from the familiar expression for the producing ratio as a function of the relative permeability, and the recoverable oil estimated as the difference of the present and abandonment saturation.

Appraisal of Study

In the appraisal of secondary recovery by either oil or gas, the primary consideration is to make certain that sufficient oil remains in the reservoir, both in total and as a fraction of the pore space so that the potential recovery will justify the contemplated expenditure. Neither method is apt to succeed unless the reservoir is reasonably continuous and homogeneous and free from extensive fractures. Water flooding should not be undertaken when there is a good reason for suspecting that an oil bank will not form. Secondary recovery with gas is most likely to succeed when the gas saturation developed by the primary production process is small.

In all cases of the appraisal of secondary recovery projects it is often necessary to make free use of published data. Predicted performance should be compared with the behavior of projects already under way or completed in similar fields, giving consideration to the degree of similarity.

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★ Removal of ferrous sulphide and other impurities from monoethanolamine in natural gas purification.

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Refinery Vessels

(Continued from page 110)

nesses shown are representative of most refiners, although one major refiner uses Schedule 40 pipe thickness as retiring on oil piping. A liberal retiring thickness is recommended since so little piping can be visually inspected. Hammer testing, test holes, and other thickness readings are only spot checks. There are many cases where line failures resulted from a thin spot, although thickness readings were satisfactory.

Retiring thickness for cast steel and forged steel valves and fittings are equal to 1½ times the required thickness for pipe of the same size.

Relief valves . . . These are tested at least annually and a careful record kept. Set pressures are governed by the A.S.M.E. code. Valves must be sized so that any pressure buildup within a vessel is relieved before that pressure exceeds design pressure by 10 per cent.

Consider what size of relief valve is required on an exchanger to prevent overpressuring should a fire ignite below the exchanger. In such cases where a code is not directly applicable, sound engineering principles should be followed. Discharges from relief valves, if flemmable, should be tied into a flare system and not released around a unit. Relief valves should be so set as to release at the vessel design pressure and reseat halfway between design and operating pressures. Thus if a vessel is operating at 200 psi. and its design pressure is 250 psi., the valve should release at 250 psi., drop the pressure to 225 psi., and reseat there.

Sometimes there is not such a large difference possible between relief valve setting and operating pressure. On hydrocarbon-vapor service, a minimum relief valve setting of 6 to 10 per cent over operating pressures has been successfully used. Decreasing this difference further invariably results in frequent maintenance and poor operation.

Pumps and compressors . . . Nozzle connections are calipered when adjoining piping is calipered. Minimum thicknesses are equal to valves of the same size and material. For other parts, the manufacturers recommendations must be obtained. Usually when the casings or cylinders become too thin, mechanical troubles develop and these defects are found.

Acknowledgment

The aid and encouragement of V. M. Norwood, manager of the Sarnia refinery, and T. J. Harvey, Sarnia plant engineer, in preparation of this article, are hereby gratefully acknowledged.

BOOK

TAX PLANNING FOR FOUNDATIONS AND CHARITABLE GIVING. By William J. Caney, J. K. Lasser, and Walter Lord. Published by Business Reports, Inc., Roslyn, L. I., N. Y. 236 pp. $12.50.

In this new research study the authors analyze the public policy which gives tax concessions for charitable gifts made by individuals and businesses. Their study spells out how churches, charities, and schools can aid in meeting the financial problems of individuals and businesses and, by doing so, increase their own financial strength. Besides a complete analysis of the advantages of establishing a foundation, the study discusses every phase of charitable giving. It explains how to make sure a donor gets his deduction. It analyzes the legal questions of corporate giving. It discusses when and how a contribution might be properly designated a business expense, and show charities how to sell a donor on making a gift. It explains the savings achieved by giving property instead of money, and analyzes the tax advantages of each of the main types of giving available.

MILES APART IN SIZE AND WEIGHT

Here are two Bethlehem drop forgings that happened to be going through the shops the same day. The small connecting rod weighed only a pound and a half. The big one, a pretty husky specimen, couldn't be cradled in anybody's hands. It weighed more than a hundred times as much as the little fellow.

This contrast isn't unusual, for Bethlehem makes drop forgings ranging in weight from a few ounces up to 250 lb. Through the years we've produced literally millions of them—gear blanks, connecting rods, hooks, wrenches, links, rings, crankshafts, tool parts—and so many other designs it's hard to estimate the number. These forgings have gone into scores of industrial fields, including petroleum, mining, aviation, power, and transportation.

Today we're better fixed than ever to fill your needs in closed-die forgings. Ours is a fully-integrated operation—everything from making the steel to cleaning and shipping the finished forgings. Call us the next time you're in the market! We'll welcome the chance to work with you and your staff.

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On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM DROP FORGINGS

The drilling contractor is due a reasonable profit because he takes many risks, makes heavy investments, and is of great service to the industry. In order to keep contract rigs like that shown above operating in the black, the A.A.O.D.C. provides a new bid sheet to encourage a realistic allocation of costs that will assure the contractor his profit and safeguard the economic health of the drilling industry.

DRILLING CONTRACTOR

Know Your Costs . . .

Use these new A.A.O.D.C. forms and

BID SPECIFICATIONS

OWNER: WELL: No.:

RIG No.: DATE START:

Location Time:	Estimated	Actual
Rig Up	Days	Days
Drlg. Contract Days	Days	Days
W.O.C., Completion and Free Time	Days	Days
Tear Down	Days	Days
TOTAL	Days	Days

Contract Footage Depth: **Maximum Depth:** **Formation:**

Deviation From Vertical:

CASING PROGRAM:	Size Inches	Weight Lbs./Ft.	Hole Size Inches	Approx. Depth — Ft.	Cement Time Allowed — Hrs.
Conductor Pipe					
Surface					
Protection String					
Oil String					
Liner					
Tubing					

MUD CONTROL PROGRAM:

Depth Interval From	To	Type Mud	Weight	Viscosity	Water Loss

Loss of Circulation Clause:

Weight Clause:

Other Protective Clauses:

INSURANCE LIMITS:

PL: PD:

Other Insurance Required:

ITEMS TO BE FURNISHED BY:	OWNER	CONTRACTOR
Mud		
Roads and Clearing		
Rig Fuel		
Rig Fuel Lines		
Rig Heating Fuel		
Water		
Water Lines		
Transportation of Contractor's Property:		
Move In		
Move Out		
Operational Transportation		
Materials for "Boxing In" Rig and Derrick		
Pits and Cellar		
Core Bits		
Core Barrel		
Bits, Reamers and Stabilizers		
Drilling In Equipment		
Other:		

Although drilling contracts are sometimes intentionally underbid simply to insure enough work to "keep a crew together," it is more often done unintentionally as a result of the failure to realize the exact nature and extent of costs.

Because there are currently several hundred more rigs than holes being drilled and profits are being pared to meet competition, a misconception of costs can result in disastrous underbids. Therefore, American Association of Oilwell Drilling Contractors has prepared a "Bid Specifications and Estimate" form that will help the contractor to recognize what comprises his total costs.

This form, reproduced here in its entirety, carries the account numbers recommended by the A.A.O.D.C. Manual of Accounting Practices and Procedures for the Oilwell Drilling Contractor. Contained in an instruction booklet with the bid form is the Well Cost Extension Chart, also reproduced here, that explains in detail the various items numbered.

Don't Bid Blindfolded

be sure every job will yield a fair profit

BID SHEET

Owner_____ Well Name _____ No. _____ Date _____

Account No.	DIRECT EXPENSE:	Per Day	Well Estimate	Actual
90-11-1	All Labor Except Supervision			
90-11-12	Supervision Incl. Trans. and Expense			
90-11-2	Supplies			
90-11-3	Maintenance and Repairs			
	Total fixed DIRECT EXPENSE per day			
	times _____ estimated days			
	OTHER DIRECT EXPENSE			
90-11-41	Bits and Reamers			
90-11-42	Move In & Out — Rigging Up & Down			
90-11-363	Other Transportation			
90-11-511	Pits, Cellar and Dirt Work			
90-11-512	Derrick			
90-11-513	Lumber			
90-11-514	Other Preparation			
90-11-52	Rig Fuel and Lines			
90-11-524	Heating Fuel			
90-11-53	Water and Lines			
90-11-54	Mud and Chemicals			
90-11-57	Special Taxes			
90-11-58	Special Services to be Furnished by Contractor			
90-11-59	Special Material to be Furnished by Contractor			
	TOTAL OTHER DIRECT EXPENSE			
	INDIRECT EXPENSE			
90-11-81	Rig Depreciation			
90-11-82	Drill Pipe Depreciation			
90-11-822	Drill Collar Depreciation			
90-11-9	Overhead Expense			
	TOTAL INDIRECT EXPENSE			
	TOTAL ALL EXPENSE			
	PROFIT			
	ESTIMATED COST PLUS PROFIT FROM CONTRACT DRILLING			
	ESTIMATED COST PLUS PROFIT			
	$_____ DIVIDED BY			
	FEET CONTRACT DEPTH			**PRICE PER FOOT**
	DAY WORK			
	Fixed Direct Expense Per Day			
	Other Applicable Expense (Fuel, Water, Etc.)			
90-11-81	Rig Depreciation per Day			
90-11-9	Overhead Expense per Day			
	PROFIT			
80-1	DAY WORK RATE WITHOUT DRILL PIPE			
90-11-82	Drill Pipe Depreciation plus			
90-11-822	Drill Collar Depreciation			
80-1	DAY WORK RATE WITH DRILL PIPE			
	Standby Time with Crews			
	Standby Time Without Crews			

Calculated By: _____ Date _____ Approved By: _____ Date _____

A booklet entitled "Mr. Well Digger" accompanies the bid form and from it are taken the chart, What Goes Into the Well, and the brief explanations of what makes up the various cost categories.

1. **Labor**—Includes all money paid for

(a) Wages, salaries and special benefits including vacation pay.

(b) Workmen's compensation insurance.

(c) Public liability and other insurance based on payroll.

(d) Any transportation furnished labor.

(e) All social-security taxes.

2. **Supervision**—All of the costs as in labor and including auto and traveling expenses. This is for tool pushers, superintendents or whoever plans and gets the job done in the field.

3. **Supplies**—All of the small, quickly used-up supplies needed at the rig like: wiping rags, paint, light bulbs, water cans, ice, stove fuel, first-aid supply, spinning rope, nails and spikes, bolts and screws, sheet iron, canvas, gasket material, roofing paper, sand paper, wash hose, hardware cloth, steel wool, babbitt and lead, batteries, flashlights, sparkplugs, small V-belts, and electric wire.

Also to be included are all kinds of hand tools, all valves, fittings, and line pipe except those used with pressure-control equipment, water lines and fuel lines; all oils, greases, lubricants and tool-joint dope. In here or somewhere else should be put the cost of fire, windstorm, marine, and other insurance covered in No. 1.

4. **Repairs and parts**—The cost of all maintenance and repairs to the drilling equipment including:

Draw works items such as shaft and drum repairs, flanges, catheads, clutches, bearings, brakes, brake bands, brake liners, guards, air control, etc.

Mud pumps, parts and repairs such as pistons, valves, liners, rods, suctions, packing, bearings, gears, pinions, etc.

Engines and transmission of power equipment parts and repairs includes heads, radiators, pistons, pins, rings, shafts, bearings, blocks, magnetos, fuel and oil pumps, valves, hose, water pumps, timers, manifolds, generators, starters, etc., and in the case of steam equipment all boiler and boiler feed equipment. All chain, V-belts, gear boxes, etc., used for the transmission of power on the rig.

Overhead string includes parts and repairs for the crown block, traveling block, swivel, hook, bails, elevators, wire line, rotary hose and their parts.

Other equipment that requires repairs and parts are such items as rotary tables, tongs, generators, compressors, blowout preventers, weight in-

Chart 1—Well Cost Extension, Contract Drilling Expense, Rotary Tools-90-11

1. LABOR AND SUPERVISION ACCOUNT

Sub-Accounts

11 Labor
12 Supervision
13 W.C. & P.L. Insurance
  131 W.C. Insurance
  132 P.L. Insurance
14 Crew Transportation
15 S.S. Taxes
16 Auto Expense—Direct

2. SUPPLIES ACCOUNT

Sub-Accounts

21 Rig Supplies
22 Hand Tools
23 Valves, Fittings and Line Pipe
24 Oils and Greases
25 Fire and Other Insurance

3. MAINTENANCE AND REPAIR ACCOUNT

Sub-Accounts

31 Draw Works—Repairs and Parts
32 Pumps—Repairs and Parts
33 Power and Transmissions—Repairs and Parts
  331 Engine, Generator and Motor
  332 Boiler Plants
  333 Transmissions and Chains

34 Overhead String—Repairs and Parts
  341 Blocks, Hooks, Etc.
  342 Swivel
  343 Wire Line
  344 Rotary Hose

35 Other Equipment—Repairs and Parts
  351 Rotary
  352 Electrical Equipment
  353 B.O.P., Etc.
  354 Operation Instruments

36 General Maintenance Expense
  361 Other Shop and Welding Expense
  362 General Maintenance Expense
  363 Transportation of Supplies
37 Fishing, Repairs, Parts, Rentals
38 Drilling String—Repair and Parts
  381 Drill Pipe—Repairs and Parts
  382 Kellys, Collars, Etc.—Repairs and Parts

4. ORDINARY OPERATING EXPENSE ACCOUNT

Sub-Accounts

41 Bits and Reamers
42 Transportation, Rigging Up and Tearing Down
  421 Trucking—In and Out
  422 Other Transportation—In and Out
  423 Winch Work and Spotting

5. OTHER OPERATING CHARGES ACCOUNT

Sub-Accounts

51 Location and Preparatory Charges
  511 Pits and Dirt Work
  512 Derrick, Rental, Erection, Etc.
  513 Lumber
  514 Roads, Bridges, Clearings

52 Fuel
  521 Fuel
  522 Fuel Lines
  523 Fuel Storage and Transportation

53 Water
  531 Water
  532 Water Lines
  533 Water Storage and Transportation

54 Mud and Chemicals

55 Coreheads and Coring

56 Well Equipment
  561 Casing and Tubing
  562 Heads and Shoes
  563 Cementing and Cement
  564 Tank and Separators

57 Sales and Contract Taxes
58 Special Services
  581 Casing Crews
  582 Elevators, Spiders, etc.
59 Special Materials

8. DEPRECIATION ACCOUNT

Sub-Accounts

81 Rig Depreciation
82 Drill Pipe Depreciation

9. OVERHEAD ACCOUNT

Sub-Accounts

91 General Overhead
92 Administration Expense

dicators, mud indicators, hole-surveying devices, measuring lines, derricks, racks, toolhouses, standby equipment, shale shakers, etc.

Shop work and welding for the purpose of keeping the rig in good repair and running order are a part of this cost.

5. **Bits and reamers** should include the cost of all types of bits and reamers used in drilling the hole. Core bits and core heads should be put in a different place such as the No. 12 Special Materials so the cost of day work special items may be picked out easily. Retipping, bit subs, bit breakers, freight and tax on bits can be included in this cost.

6. **Transportation** includes all of the cost of moving drilling equipment to and from location and rigging up and down. Transportation costs for moving all items to and from the well should be included except those taken into account in the cost of supplies, repairs, parts and bits.

7. **Location and preparatory costs** are all the costs of clearing the location, digging pits and cellar, building roads and bridges, laying matting, building turn-arounds, etc.

8. **Fuel and fuel lines** should include all of the costs of the purchase price, taxes, storage, transportation and conditioning of fuel used for the operation of drilling equipment.

9. **Water and water lines** includes the total cost of water purchased for use in drilling operations. If the water is bought by contract the total amount charger is included. If water is produced by drilling a water well the cost of drilling the well, coring, setting equipment for lifting the water and subsequent dismantling costs are included in this expense group. In other cases, such as impounding water with a dam, the total cost of producing water and transporting it to the rig for use is the amount to be used.

10. **Mud and chemicals** refers to the total cost of all materials added to the water to make up the drilling fluid used in drilling and in controlling well pressures. If the operator pays for all costs beyond a certain limit, do not include any amounts that will be so paid either directly or by refund.

11. **Special services** are all extra services which are required to be furnished without reimbursement. Such things might be electric logging, drill-stem tests, temperature tests, straight-hole tests, cementing services, acidizing, shooting, core analysis, etc. If any of these special services are to be repaid by the operator they should not be included in the total costs used to find the cost of drilling by the foot or by the day.

12. **Special materials** includes any extra materials not included above but

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Capital and Surplus $50,000,000.00
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MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

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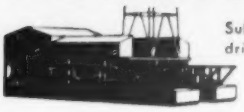
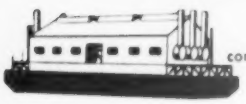


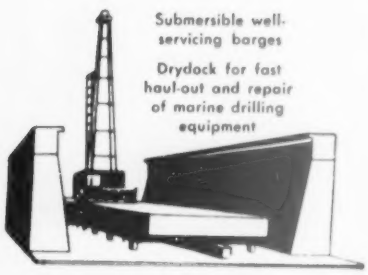
Submersible drilling barges

Tugs



Boiler and compressor barges

Water, oil, and supply barges



Submersible well-servicing barges

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SHIPBUILDING CO.

Orange, Texas

CHART 2—WHAT GOES INTO THE WELL

	Est.	Actual
A. Put in every working day:		
1. Labor	$	
2. Supervision		
3. Supplies		
4. Repairs and Parts		
Total Immediate Cost each work day	$	
This cost in $——— per day times———days used in drilling the well is in total for the well	$	
B. And put into each well are:		
5. Bits and Reamers		
6. Transportation		
7. Location and Preparatory Costs		
8. Fuel and Lines		
9. Water and Lines		
10. Mud and Chemicals		
11. Special Services		
12. Special Materials		
13. Fishing		
Total Well Cost to be paid in cash or by account		
C. Add the hidden cost of the well:		
14. Rig Depreciation		
15. Drill Pipe Depreciation		
16. Overhead Expense		
ALL of the Cost	$	
Plus:		
Profit—Your pay for taking the risk, making the investment and being of service to the oil industry	$	
EVERYTHING—The Total		
Everything $——— divided by the number of feet of drilling———equals what you have to take out $———per foot,		
Or, divide by days and you have the cost per day		$

required as a part of the drilling contract. If these are to be repaid by the operator they should not be included in the costs used for the purpose of obtaining the cost of drilling by the foot or by the day.

13. **Fishing** includes all amounts paid for special tools, services, and the rental, repair and upkeep of all fishing tools. All of the costs of remedying trouble in the hole should be made a part of this cost.

14. **Rig depreciation** covers the cost of wearing out all of the drilling equipment not covered as expense items above with the exception of drill pipe.

15. **Drill-pipe depreciation** represents the costs of all drill pipe, subs and drill collars worn out in drilling. Each well drilled uses up some part of the value of drill pipe and that value has to be recovered as a cost if you are going to take out more than you put into the cost of drilling a well.

16. **Overhead expense** must not be overlooked. All the general costs of doing business are recovered here. Everything that has not been put into the other expense such as office salaries, rent, telephone, taxes, general insurance, travel and the costs of finding contracts needs to be recovered in part from each well. The cost of keeping records, making payrolls, accounting, running an office and generally managing the drilling company are not paid in such a way that they can be changed directly to a well so each well drilled must contribute enough income to pay its share of the total cost.

Finally . . . Don't forget **profit!** Something no one else is going to add in for you. And remember, it is balanced precariously on all the costs of drilling. A little mistake — through lack of knowledge—and profit will come tumbling down.

"This land ain't worth a hoot no more, stranger—can't even dig post holes."

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ALLOY STEEL TUBES

SEAMLESS — MECHANICAL — PRESSURE — CORROSION RESISTANT

TYPICAL ANALYSES:

Carbon	5 Chrome ½ Moly
Carbon ½ Moly	7 Chrome ½ Moly
½ Chrome ½ Moly	8 Chrome ½ Moly
1 Chrome ½ Moly	8 Chrome 1 Moly
1¼ Chrome ½ Moly	9 Chrome 1 Moly
2 Chrome ½ Moly	3% Nickel 7% Nickel
2¼ Chrome 1 Moly	5% Nickel 9% Nickel

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Analyses to meet conditions where heat, corrosion, pressure and structural strength are involved.

SIZE RANGE — WALL THICKNESS:

½ to 6 inches O.D. — wall thickness .035 to 1.000 inch.

TYPICAL APPLICATIONS:

Pressure tubes — Superheater tubes — Condenser tubes — Still tubes — Evaporator tubes — Barrel tubes — Oil-well Pump Barrels — Mechanical tubes — Aircraft tubes — Propeller tubes — Rollers for Transmission Chains.

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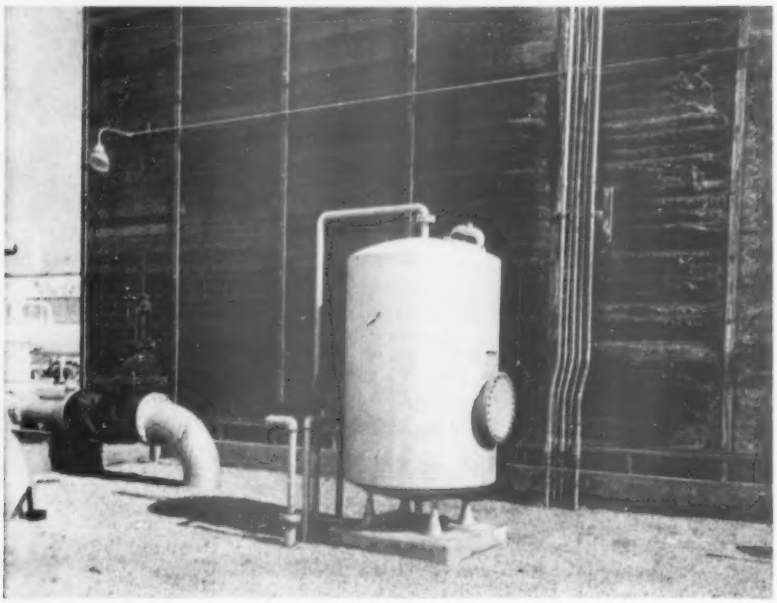

SIDESTREAM FILTER of Reef Fields Gasoline Corp.'s East Vealmoor plant, Howard County, Texas. (Photo courtesy Continental Products Corp.)

How sidestream filter helps in keeping cooling system clean

IN many cooling systems, excessive suspended matter in the cooling water is one of the main factors in fouling of lines, jackets, heat-exchange surfaces, cooling-tower pans, and basins. This condition can be easily corrected through the use of a sidestream filter.

The water filter is appropriate for cooling-tower service as well as for closed systems. Sidestream filters have already found wide application for closed systems. An open cooling system is defined as one depending upon evaporation of the water for cooling. The closed type requires indirect cooling, such as air-cooled fin-fans. A characteristic of the closed system is the low makeup requirement vs. larger makeup volume for the open system.

For open systems . . . The need for filtration is evidenced by accumulation of sand and muck in the system. Suspended materials tend to drop out in low-velocity areas. Critical points are cooling tower basin, flat pan above coils, compressor jackets, and exchanger heads. A complete chemical-treating program is essential to freedom from true scale (calcium carbonate, silica, and calcium sulfate) and corrosion. However, many cooling systems with excellent chemical control experience severe fouling with suspended matter.

Designing the filter . . . Full-flow filtration of the circulating stream is generally uneconomical and is not necessary. It is sufficient to filter only a portion of the total water flow. Design of the filter should consider the following factors:

1. **Geographical location of plant.** Air contamination varies. Sand storms in the West Texas-New Mexico area are frequent. In a few hours, several tons of sand may be added to the cooling tower water. In other sections, foliage debris is added to the water.

2. **Size of system.** The volume of water in the system indicates the amount of water to be filtered in a given time. A 100,000-gal. volume with 85-g.p.m. filter requires 20 hours for filtering the 100,000 gal.

3. **Type of cooling unit.** The possible variations are suggested by: (a) atmosphere tower or mechanical-draft tower; (b) Shell-tube exchangers or atmospheric coil sections; (c) V-pans or flat pans.

4. **Source of makeup water.** Well water has good clarity in most instances. Surface waters from rivers and lakes bring silt into the system.

5. **Pretreatment of water.** Effluent from lime or lime-soda softeners, even though filtered, increases suspended matter. Zeolite-treated water usually has low turbidity.

6. **Other related items.** Recirculating pump rate and makeup and blowdown volumes are usually considered.

An accepted rule of thumb is to base the size of the filter on the circulation volume. A procedure for this is 1 per cent of the recirculating stream. For example, a cooling tower located in West Texas with sandy environment, using lime-soda-softened well-water makeup, and circulating 8,500 g.p.m., would be met with 85 g.p.m. sidestream filter installation. As little as 0.1 per cent of the circulated volume can be adequate where atmospheric contamination is less severe.

Velocity through the filter and type of filter media must be considered. Permissible velocities vary with filter material in any application. For sand filters, 1 to 2 g.p.m. per sq. ft. is recommended, and for carbonaceous material, such as Anthrafilt, 2 to 4 g.p.m. per sq. ft. will give satisfactory results. Sand filters generally tend to increase silica value of the water, so the decision favors Anthrafilt.

Provision for backwashing should be made and the cooling-tower water can be used for this purpose. This eliminates a backwash water waste, since this volume is subtracted from blowdown requirements.

An appropriate installation is an automatic backwash procedure activated by a dissolved solids conductivity meter mechanism. This disposes of accumulated dissolved and suspended matter simultaneously.

The sidestream filter is also credited with reducing the problem of algae and bacterial growths, inasmuch as the filtered stream will lose dead and live organisms in the bed. Oil removal is also achieved by filter beds which are properly designed and maintained. Occasional steaming and cleaning with filter cleaners are recommended to keep the filter in top performance.

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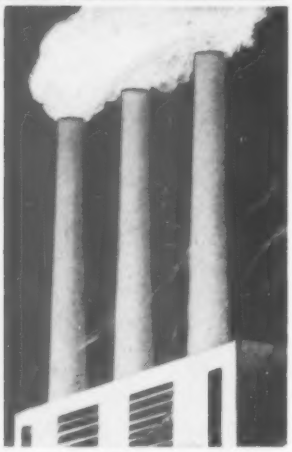

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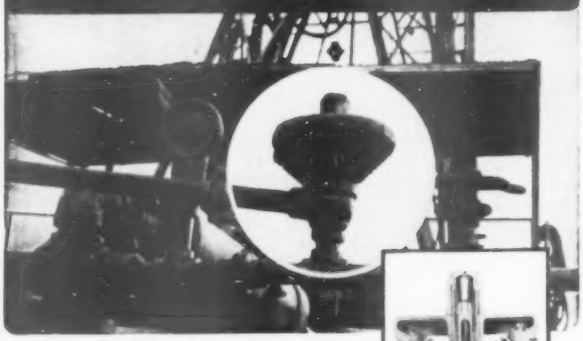

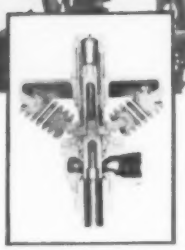

Kinzbach Model 112 Relief Valve shown in closed position.

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GOOD housekeeping is aided by using these racks which were built by personnel of Service Pipe Line Co. and are used in this company's equipment buildings from western Nebraska to southern Oklahoma. (Photos courtesy of "The Connecting Rod.")

FLANGE RACK . . . This was made from two long lengths of 4-in. and two ½-in. pieces of steel plate. Different sizes of flanges can be stacked here.

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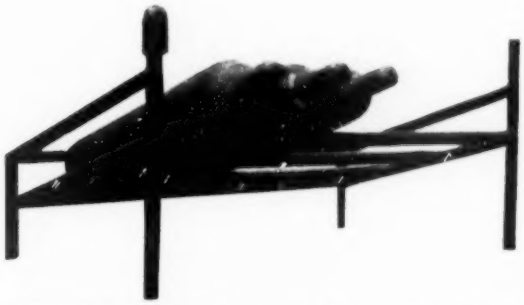
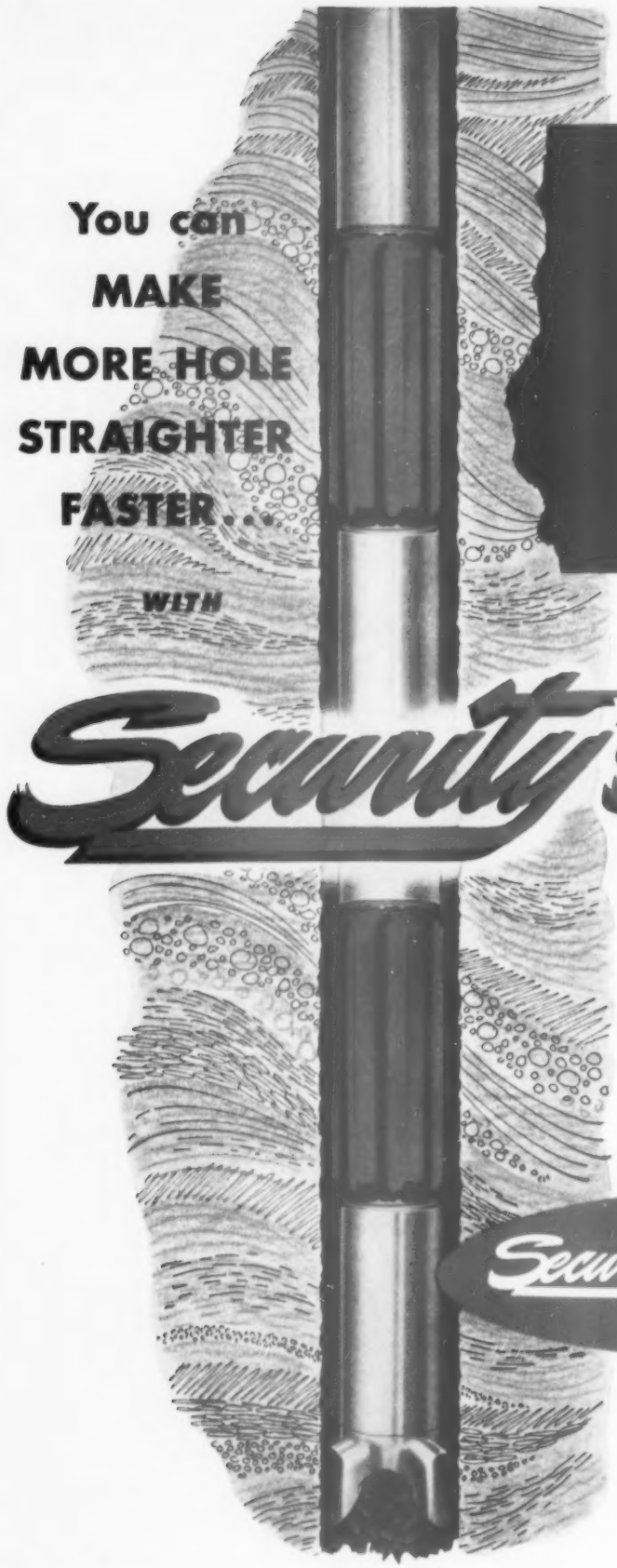


OXYGEN-BOTTLE RACK . . . This holds six bottles. It was made from scrap 2-in. pipe.



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Simplify Your Oil and Gas Calculations

by Louis J. Murphy

SEVERAL nomograms have been prepared which save much time and effort in design and performance calculations in (1) selection of oil heaters, (2) spacing of gas-lift valves, and (3) determination of the refrigeration capacity for oil cooling and wax separation. They cover the usual ranges encountered in such problems and insure accurate and fast determination of the unknowns. A number of examples are given to illustrate use of the charts. The first chart dealing with oil and gas heating problems is presented here and two other nomograms will be given in the next installment.

Oil-Heater Selection

There are two steps necessary in choosing an oil heater: (1) determination of the amount of heat required to produce the desired temperature rise, and (2) determination of the area of heat-transfer surface necessary under the given conditions.

Example . . . How much heat is required to raise the temperature of 50 bbl. per hour of an oil-water mixture flowing through a heater if desired temperature rise is 50° F. and there is 25 per cent water in the mixture?

Solution . . . Enter Chart 1 at 25 per cent water in the mixture and draw a straight line through the temperature rise of 50° F. on the right. Then, from 50 bbl. per hour on the left, draw a straight line through the intersection of the first line with the pivot. Read the amount of heat required as 500,000 B.t.u. per hour on the second stem from the left.

Note that if the fluid to be heated is pure oil, the chart is entered at the point marked 0 per cent water in the mixture. At the amount of water in an oil-water mixture increases, so does the amount of heat needed to produce a given temperature rise.

Where the quantity of mixture to be heated is less than 10 bbl. per hour, or greater than 100 bbl. per hour, move the decimal point in the given quantity to the right or the left until a value within the chart range is obtained. Then solve as above and move the decimal point in the answer the same number of places, but in the **opposite** direction. For instance, if the quantity of mixture to be heated in the above problem was 500 bbl. per hour, instead of 50, move the decimal point one place to the **left** in 500 to obtain 50. Solve as described. Then move the decimal point one place to the **right** in 500,000 to obtain 5,000,000 B.t.u. per hour.

Example . . . What area of heat-transfer surface is needed to supply 500,000 B.t.u. per hour to the oil in the above example? The logarithmic mean temperature difference across the heater is 200° F. The heat-transfer coefficient for the type of heater to be used is 50 B.t.u. per square foot per hour per °F. l.m.t.d.

Solution . . . Enter Chart 2 (see next installment) on the left at 500,000 B.t.u. per hour and draw a straight line through the heat-transfer coefficient of 50 B.t.u. per square foot per hour per °F. l.m.t.d. on the right. Then, from the l.m.t.d. of 200° F. on the left, draw a straight line through the intersection of the first line with the pivot. Read the area required as 50 sq. ft. on the second stem from the left.

Chart 1 is based on the relation:

$$H = h_b B t_d$$

where:

- H = heat required to raise mixture temperature, B.t.u. per hour
- h_b = heat in B.t.u. required to raise 1 bbl. of mixture per hour 1° F. (h_b is a function of the percentage of water in the mixture)
- B = quantity of oil heated, bbl. per hour
- t_d = temperature rise desired, °F.

Chart 2 is based on:

$$A = H/U \text{ (l.m.t.d.)}$$

where:

- A = heat-transfer area required, sq. ft.
- H = heat to be transferred, B.t.u. per hour
- U = heat-transfer coefficient for the type of heater being considered, B.t.u. per sq. ft. per hour per °F. l.m.t.d.
- l.m.t.d. = logarithmic mean temperature difference, °F.

Heating Gas

The amount of heat required to raise the temperature of a given quantity of gas is a function of the gas density, specific heat, and temperature rise. This chart correlates these factors.

Example . . . How much heat must be supplied to raise the temperature of 200,000 cu. ft. of gas 20° F. if its density is 0.03 lb. per standard cubic foot and its specific heat is 0.4 B.t.u. per pound per °F.?

Solution . . . Enter the chart on the left at a density of 0.03 lb. per standard cubic foot and draw a straight line through 200,000 cu. ft. per hour on the right. From the intersection of this line with pivot A, draw a line through the specific heat of 0.4 on the left. Lastly, from the intersection of the second line with pivot B, draw a straight line to 20° F. temperature rise on the right. Read the heat required as 48,000 B.t.u. per hour.

Once the amount of heat is known, Chart 2 can be used to determine the heat-transfer area required to give the desired temperature rise. The relation for determin-

Author is mechanical engineer with International Engineering Associates, New York.

ing the amount of heat needed to raise the temperature of a given quantity of gas is:

$$H = dVht_d$$

where:

H = heat required, B.t.u. per hour
d = gas density, lb. per standard cubic foot
V = gas volume heated, cu. ft. per hour
h = specific heat of gas, B.t.u. per pound per °F.
t_d = temperature rise desired, °F.

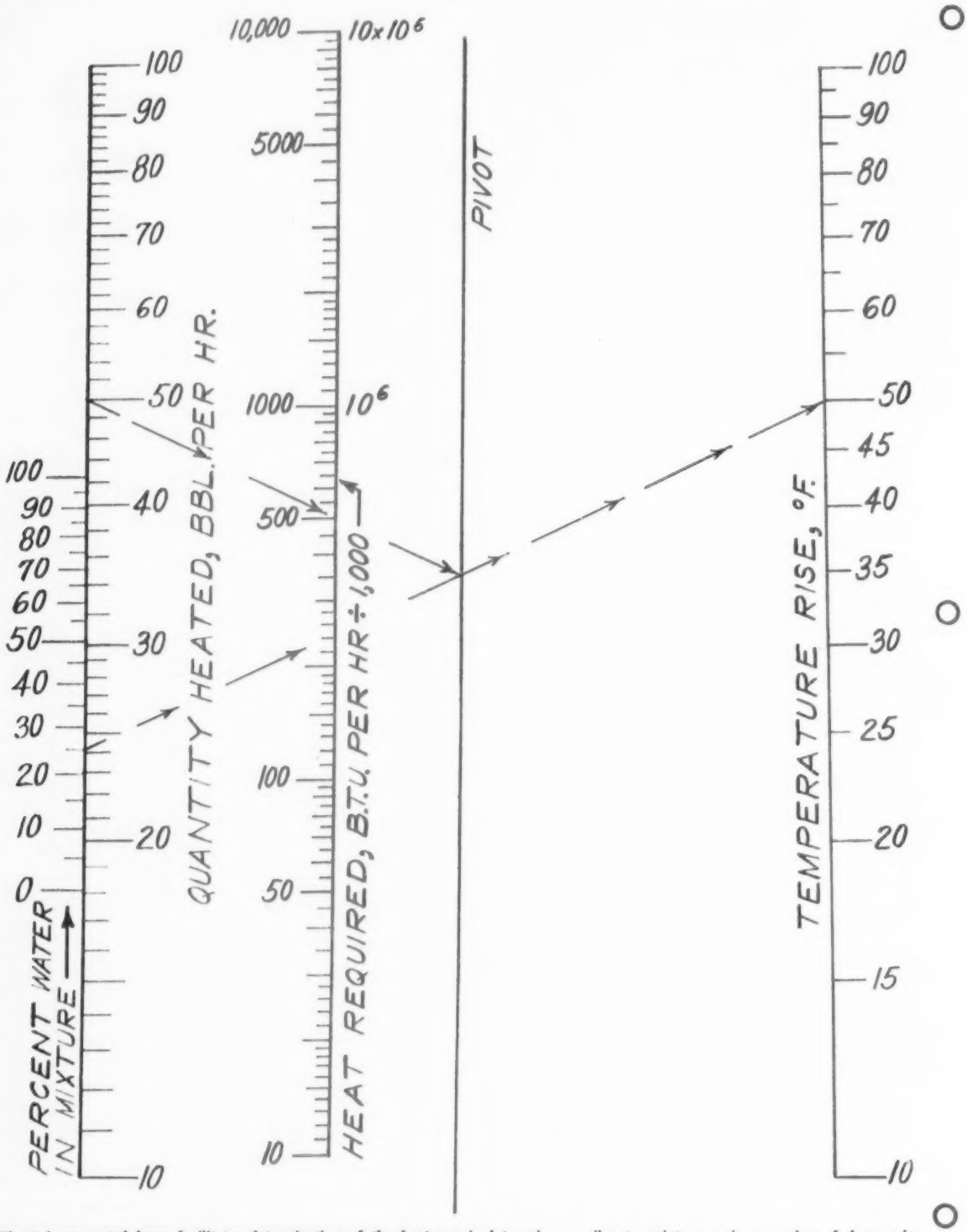

Chart 1, presented here, facilitates determination of the heat required to raise an oil-water mixture a given number of degrees in temperature, as in emulsion heaters. Chart 2, for determination of heat-transfer surface and Chart 3, for heat required in heating a gas, will be presented in installments to follow.

How to Design and Evaluate Absorbers—6

by R. J. Hull and K. Raymond

A METHOD of evaluating the factors A_E and A_C, which overcomes the limitations of previously discussed methods, is shown on Fig. 8. The effective absorption factor A_E is presented in terms of the fractional distance between the bottom and average conditions in the column, and the factor A_C is presented in terms of the fractional distance between the bottom and top conditions in the column. The values of T_{RO}, T_{DG}, T_{AV}, $(L/V)_{BTM}$, $(L/V)_{TOP}$, and $(L/V)_{AV}$ to be used in Fig. 8 are developed as follows:

T_{RO}, T_{DG}, T_{AV}—rich oil, discharge gas, and arithmetic average tray temperatures are obtained by methods explained in previous sections.

$(L/V)_{BTM}$ — a preliminary value for first trial calculation purposes is taken as $(L_o + S)/V_{IG}$; where L_o and V_{IG} are as defined previously, and S is total shrinkage. This value should be corrected in subsequent calculations to obtain $(L/V)_{BTM}$ in terms of the vapor leaving the bottom tray. An approximate multiplier to obtain the corrected $(L/V)_{BTM}$ is equal to 1.000 plus the fractional shrinkage of propane and heavier per theoretical tray in the column. Values of this multiplier vary from 1.005 to 1.035.

$(L/V)_{TOP}$—Equations 4 and 5 are used to obtain the quantity of liquid in the top section of the absorber. Then, $(L/V)_{TOP}$ is simply, L_1/V_{DG}.

$(L/V)_{AV}$—the arithmetic average of $(L/V)_{BTM}$ and $(L/V)_{TOP}$.

Authors are with California Research Corp., La Habra, Calif. Paper presented at C.N.G.A. meeting, Los Angeles, October 8-9, 1953.

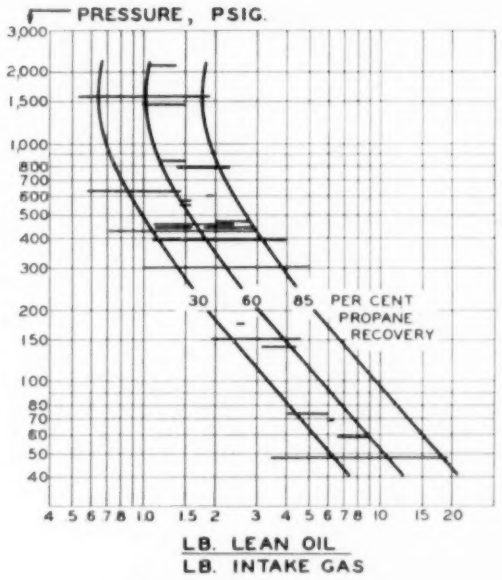

Fig. 9—Range of investigation.

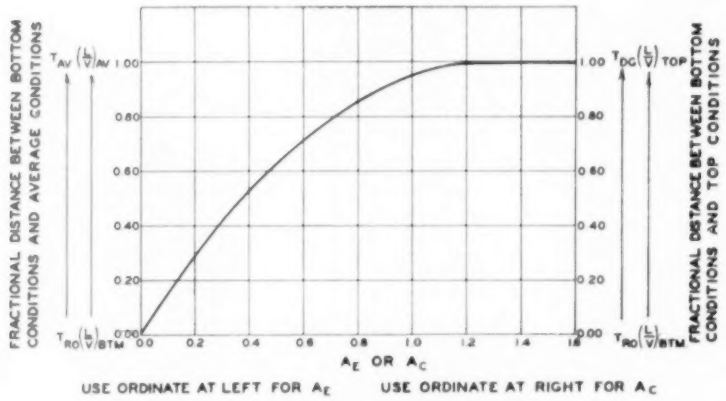
FRACTIONAL DISTANCE BETWEEN BOTTOM CONDITIONS AND AVERAGE CONDITIONS
T_{AV} $(\frac{L}{V})_{AV}$
T_{RO} $(\frac{L}{V})_{BTM}$
0.00 0.20 0.40 0.60 0.80 1.00
0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6
A_E OR A_C
T_{DG} $(\frac{L}{V})_{TOP}$
T_{RO} $(\frac{L}{V})_{BTM}$
FRACTIONAL DISTANCE BETWEEN BOTTOM CONDITIONS AND TOP CONDITIONS
USE ORDINATE AT LEFT FOR A_E
USE ORDINATE AT RIGHT FOR A_C

Fig. 8—Effective absorption factors.

4. Over-all Tray Efficiencies

Actual component yields were determined for all absorber runs having requisite analytical data. Indicated over-all tray efficiencies were then obtained for components well away from the infinite plate line by relating the calculated absorption factors to the actual yields and using the Kremser-Brown absorption chart, Fig. 10 (next page). For entire pressure range from 100 to 2,100 psig., average over-all tray efficiencies obtained were 37 per cent for propane, and 33 per cent for the butanes. Tray efficiencies for propane ranged from 30 to 38 per cent, and those for butanes ranged from 28 to 36 per cent. Considering the wide range of number, design, and loading characteristics of trays covered in the absorber test data, the individual absorber efficiencies were remarkably consistent. No column showed unusually high efficiency, and the one column which showed abnormally low efficiency was replaced.

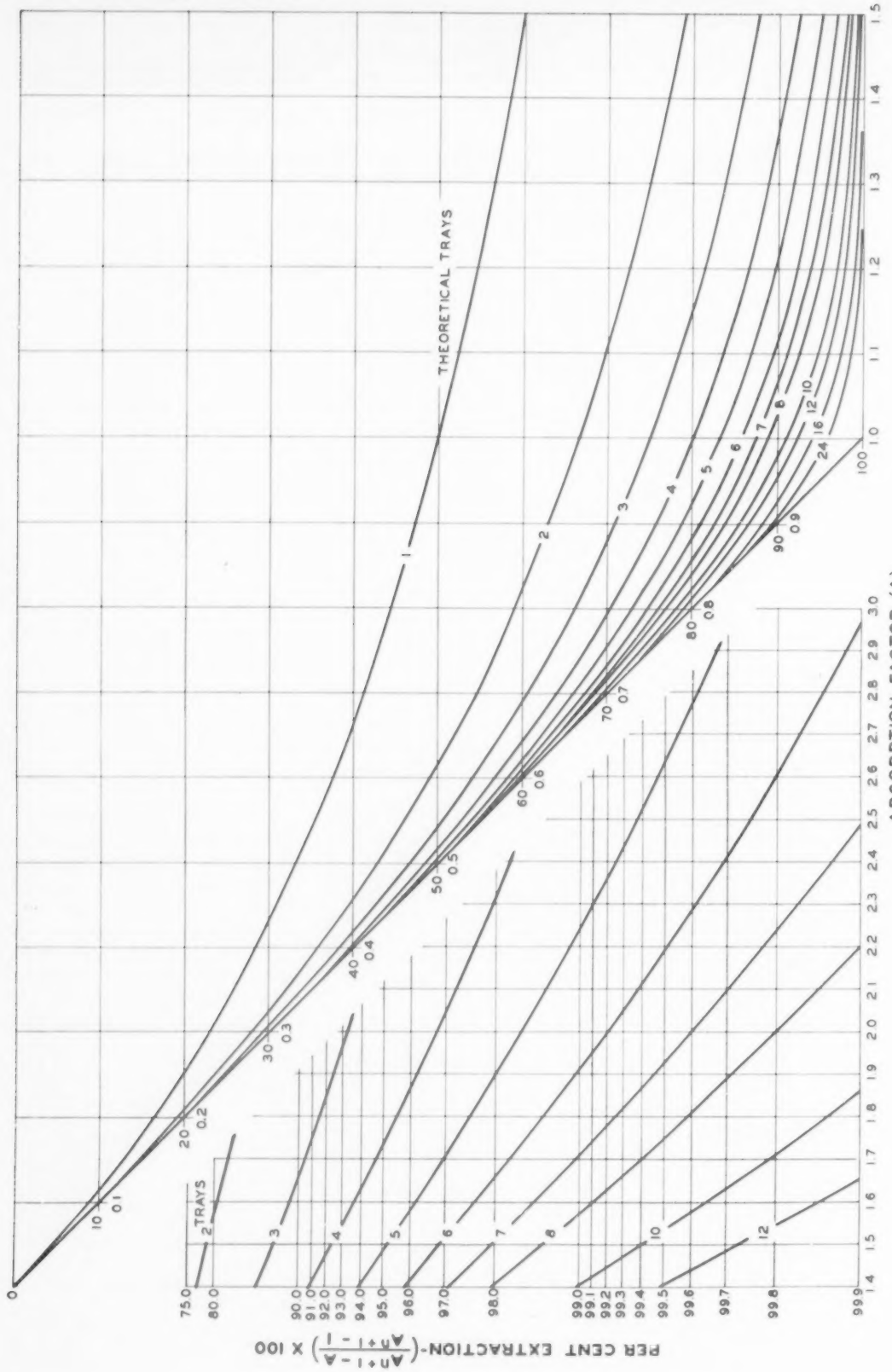

Fig. 10—Absorption factor vs. per cent extraction.

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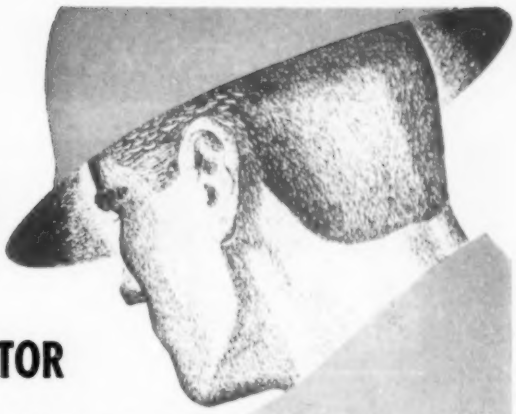
OFF-N-ON

DRILL PIPE AND CASING PROTECTOR



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The cam locks the Protector on with a tight grip that won't jar loose, can't slip, and won't move in any way. This cam lock is easy to open and to close; yet it closes with a positive grip that can't work loose. The cam lock is an integral part of the VETCO Protector with nothing to misplace, nothing to drop off in the hole. Frequent changes do not hurt the Protector.

So now with complete freedom you can use pipe progressively throughout the string. The same rubbered pipe is not used at top hole all the time. You no longer need to lay down rubbered pipe while tripping. VETCO Off-N-On Protectors will pay out in rig time saved.

The forged cam lock is built right into the VETCO Protector. Nothing to come loose and fall in the hole. Nothing can loosen the tight lock.

The alloy steel bands form a strong skeleton to grip the pipe. Rubber is compressed between the metal bands and the pipe for a tight grip which prevents movement of the protector.

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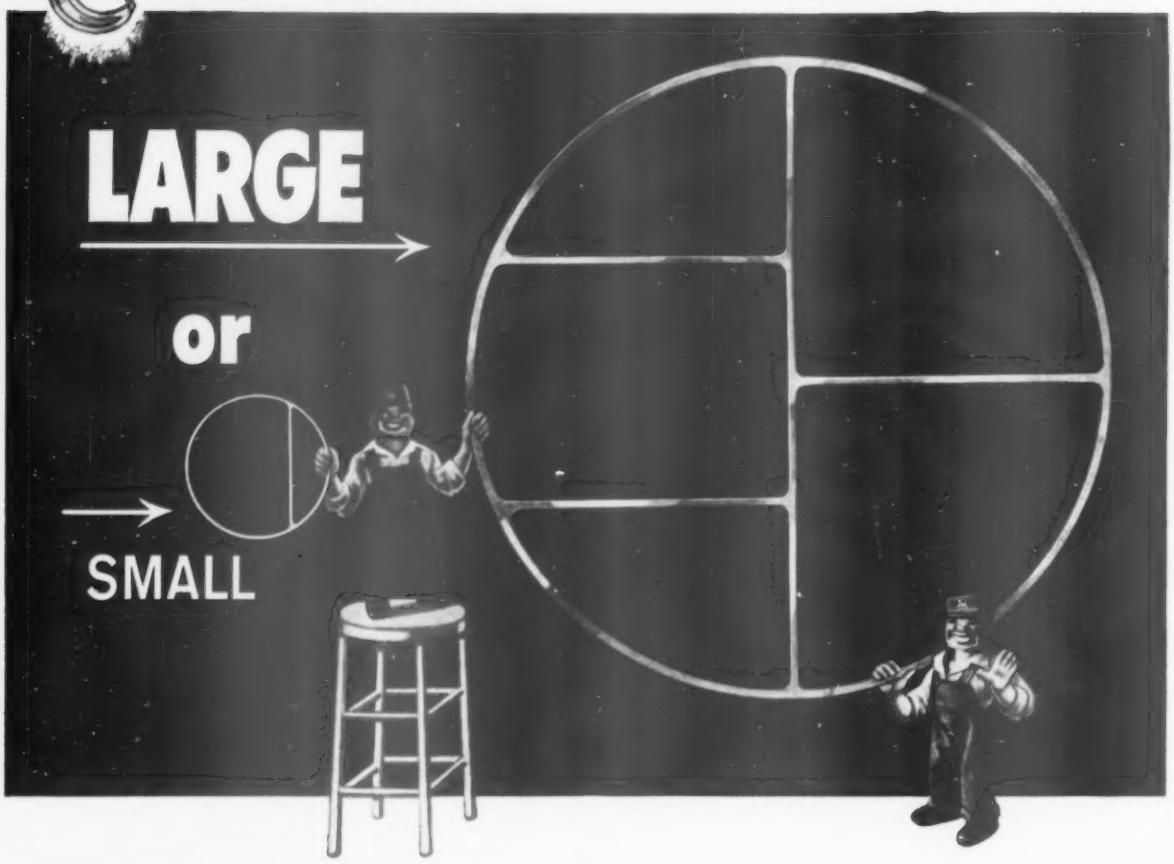

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Properties of Catalytic Cycle Stocks

by W. L. Nelson
Technical Editor

"What are the diesel indexes or ignition properties of catalytic cycle stocks?" D. M.

Only two publications are known to show the effect of conversion and of charge-stock properties on the characteristics of catalytic recycle stocks and these two sources are not entirely consistent with one another. These references are: Olsen and Sterba, "Effect of Reactor Temperature on Product Distribution and Product Quality in Fluid Catalytic Cracking," Chem. Engineering Progress, Nov. 1949, p. 692; and Smith and Bland, "Properties of Typical Products Refined by Houdry Cracking Process," The Oil and Gas Journal, April 13, 1944, p. 209. These sources and scattered data in the literature were analyzed and the general but approximate relationship of Table 1 was obtained.

In general, the light and heavy portions of the cycle stock have about the same characterization factor for once-through operations.

The cycle stocks produced during recycling operation are generally lower than shown in Table 1, particularly the heavy cycle stock which may occasionally have characterization factors that are 0.3 unit lower than in once-through operations.

The relationship between diesel index (or cetane number) and characterization factor are not entirely consistent but a study of these relationships based only on catalytic cycle stocks indicate the diesel indexes shown in Table 2. The diesel indexes of Table 2 may be converted to approximate cetane numbers by the following relationship which is also based on cycle stocks:

Diesel index	Cetane No.
25	33.5
30	39.5
35	44.5
40	48.5
45	52
50	55

It is useful to note from Table 2 that the degradation in diesel index caused by increasing conversions is almost uniform for all stocks. Thus, the diesel index of cycle stocks produced at 40 per cent conversion are lower than the diesel index of the parent feed stock by about nine units as shown in Table 3.

TABLE 1 — APPROXIMATE CHARACTERIZATION FACTORS OF ONCE-THROUGH CATALYTIC CYCLE STOCKS AS A FUNCTION OF FEED-STOCK PROPERTIES AND PERCENTAGE CONVERSION

Characterization factor of feed stock	Characterization factors of cycle stocks for these conversions				
	40 per cent	50 per cent	60 per cent	70 per cent	80 per cent
11.4	11.1	10.9	10.73		
11.5	11.18	11.08	10.93		
11.6	11.33	11.24	11.11	10.82	
11.7	11.49	11.39	11.26	11.03	
11.8	11.6	11.51	11.36	11.19	10.75
11.9	11.69	11.61	11.46	11.31	10.94
12.0	11.74	11.66	11.52	11.37	11.06
12.1	11.78	11.7	11.56	11.41	11.14
12.2	11.82	11.72	11.59	11.43	11.18

TABLE 2—DIESEL INDEXES (APPROXIMATE) OF CATALYTIC CYCLE STOCKS AS A FUNCTION OF PERCENTAGE CONVERSION

Percentage Conversion	Diesel indexes of cycle stocks								
	11.4 C.F.	11.5 C.F.	11.6 C.F.	11.7 C.F.	11.8 C.F.	11.9 C.F.	12.0 C.F.	12.1 C.F.	12.2 C.F.
None—or feed stock	42.0	46.0	49.0	53.0	57.0	61.0	65.0	68.0	72.0
40	31	33.5	38.5	44.0	49.5	53.5			
50	26.5	31	35.5	40.5	45	50	52		
60	23	27	31.5	36	39.5	43	45.5	47.5	49
70			25	29.5	34	37.5	39.5	41	42
80*					23.5	27.5	30.5	32.5	33.5

*Based mainly on recycling operations.

TABLE 3 — APPROXIMATE DEGRADATION IN DIESEL INDEX AS A FUNCTION OF PERCENTAGE CONVERSION

Percentage conversion	Decrease in diesel index	
	Range	Average*
40	7.5—12.5	9
50	11.0—15.5	12
60	17.0—23.0	18
70	23.0—30.0	24
80	33.0—39.0	34

*For the most common types of crude oils.

Ocean Distances And Freight Rates

"Where can we learn the distances between seaports throughout the world? The atlas does not seem to show the distances between ports." H. O. P.

Although the distances between New York and the main ports of the world (and some other miscellaneous voyages) are listed in the World Almanac of the New York World-Telegram (published yearly), only government publications present extensive listings.

The most extensive listing of distances is a publication of the Hydrographic Office of the Navy Department, H.O. 117 "Table of Distances Between Ports, 1943." It pertains mainly to world ports, and accordingly only the main ports of the United States are listed. It is a book of about 500 pages and each page lists about 40 ports. Possibly as many as 40,000 distances can be determined by various combinations of routes.

Distances between ports and shipping points around the United States and on its inland waters are listed in a booklet of the Coast and Geodetic Survey of the Department of Commerce, entitled "Distances Between United States Ports."

Transportation costs vary widely, but as an approximation the costs are somewhat as follows:

Dirty oil cargoes (1946)—$1.60 per 1,000 ton-miles.

Coal vessels (1951)—$3.20 per 1,000 ton-miles.

In these, tons are long tons (2,240 lb.) and miles are nautical miles (1.15 statute miles).

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LONG STROKE HYDRAULIC PUMPING

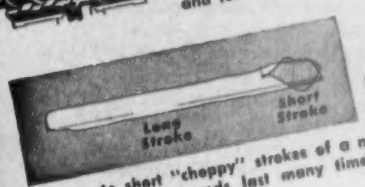
Hundreds of new Pelton Long Stroke Units mark oil field horizons today. Here are results typical of many installations: On an 8100 ft. well previously producing 400 B/D with a 108" beam pumper, our 30 ft. stroke unit on the same well produced 925 B/D. You can expect similar results from your wells which have sufficient potential.

Simple as ABC are the operating principles outlined below. Pelton, engineers in hydraulics for over 73 years have applied proven hydraulic principles to oil well pumping equipment with outstanding success. There's a Pelton Unit for every application, from 8 to 30 ft. stroke, from 10,000 to 40,000 pounds polished rod load. Write today for our engineering recommendations.

1 Like the hydraulic elevator the Pelton Unit utilizes the principle of the hydraulic ram to achieve enormous power.

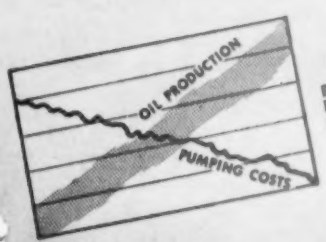
2 Pelton utilizes time-proven sucker rods to actuate bottom hole plunger pump.

3 Positive displacement circulating pump delivers hydraulic fluid within a closed cycle system from balance tank to power piston and return. Assures constant polished rod velocity and low sucker rod fatigue stresses.



4 Dynagraph cards illustrate smooth, continuous and uniform loading on sucker rods compared to short "choppy" strokes of a mechanical unit. Field records show that rods last many times longer.

5 Production increased by longer strokes and by minimizing effect of rod stretch.



6 Oil production rises while pumping costs drop. Many Pelton Long Stroke Hydraulic Pumping Units pay out in 3 to 9 months.

PELTON

WATER WHEEL COMPANY

Subsidiary of Baldwin-Lima-Hamilton Corp.
Oil Industry Machinery Division

3447 East 54th Street, Los Angeles 58, California

Los Angeles-San Francisco-Avenal-Dallas-Houston-Odessa-New York City

Pioneers in hydraulic pumping equipment for the oil industry.

Underground Corrosion

New Techniques in Control

by O. C. Mudd

PART 1 of this series (issue of November 30) was devoted to some pointers on use of zinc or similar metal in place of copper-clad rods. Part 2 (issue of December 7) was concerned with galvanizing steel structures to conserve protective current.

Electrical-Current Drainage Bonds

Electrical - current drainage bonds between underground structures are installed primarily:

1. To establish equality of protection between adjacent structures.
2. For alleviating damage to nearby unprotected structures.

Bonds installed for the purpose described in (1) are usually of low resistance and these need no consideration except for safety precautions when opened.

Bonds described under (2) are adjusted for resistance to restrict the amount of current flow.

The results from installations using low conductance wire can be illustrated from experience. Resistance bonds were installed at 23 pipeline crossings in North Texas during 1937 using No. 18 Nichrome wire. Inspections of these bonds during 1939 revealed only five remaining. Those missing were apparently vaporized by lightning current surges.

Bonds installed with No. 12 Nichrome wire have remained intact for more than 8 years. It is preferable when possible to install such bonds in suitable boxes above ground as illustrated in Fig. 4 to allow quick inspection and adjustment when required.

Current flow . . . Recent experiences demonstrate the need of unidirectional electrical devices in bonds between different structures to control current flow direction, particularly where each structure involves one or more sources of protective current.

Author is senior corrosion engineer, Shell Pipe Line Corp., Houston. Paper presented before session on transportation, annual A.P.I. meeting, Chicago, November 10.

Tests at one bond indicated 0.5 amp. flowing in the desired direction from one structure to another. A germanium rectifier element was inserted in the bond to prevent reverse current flow in case of failure at the impressed current source on the draining line. After inserting this rectifier element current flow measured 1.0 amp. in the desired direction and an ammeter bridged around this element simultaneously indicated 1.0-amp. flow in the opposite direction, hence new complex problems face the corrosion engineer and new techniques are essential in determining real values under such conditions.

Diagrams of this bond connection are illustrated in Fig. 5 showing current magnitude and direction.

Safety precautions are important when working with bonds between lines and this is evident from the previous history of destroyed bonds. No work by personnel should be done on or near bonds when any visible electrical storms are in progress!

Pouring water over the contact during opening will minimize ignition hazards and provisions for opening contacts submerged in water or nonflammable liquid will eliminate spark hazards.

Fig. 4—Resistance bonds installed in steel cabinet. Shunts included in circuit to allow checking current without opening bond.

Surge arresters . . . Electrical surges from lightning or other electrical sources causing damage to drainage bonds have likewise caused damage to insulating flanges and provisions are necessary to bypass these surges without damaging flange insulation.

Records thus far indicate that flange insulation is seldom damaged where the soil resistivity is less than 3,000 ohms per cubic centimeter and the severity of damage increases with increasing soil resistivity.

High potential power transmission lines paralleling pipe lines especially in high-resistance soils have caused unusual damage to flange insulation and surge gaps. Fig. 6 is a photograph of damaged surge gaps removed from insulating flanges near a high potential power line.

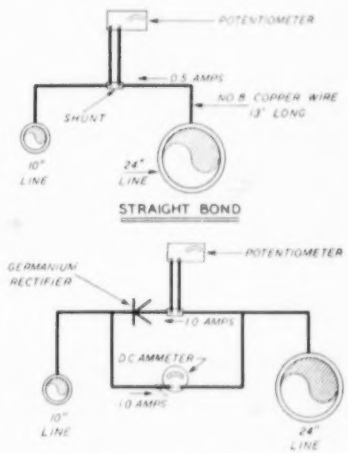


Fig. 5—Bond with rectifier.

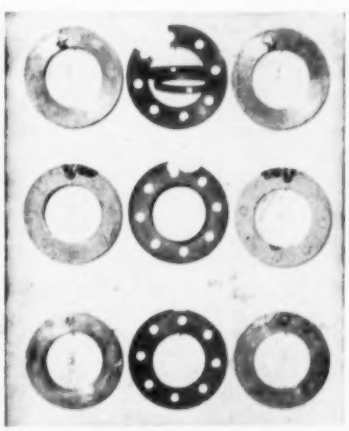
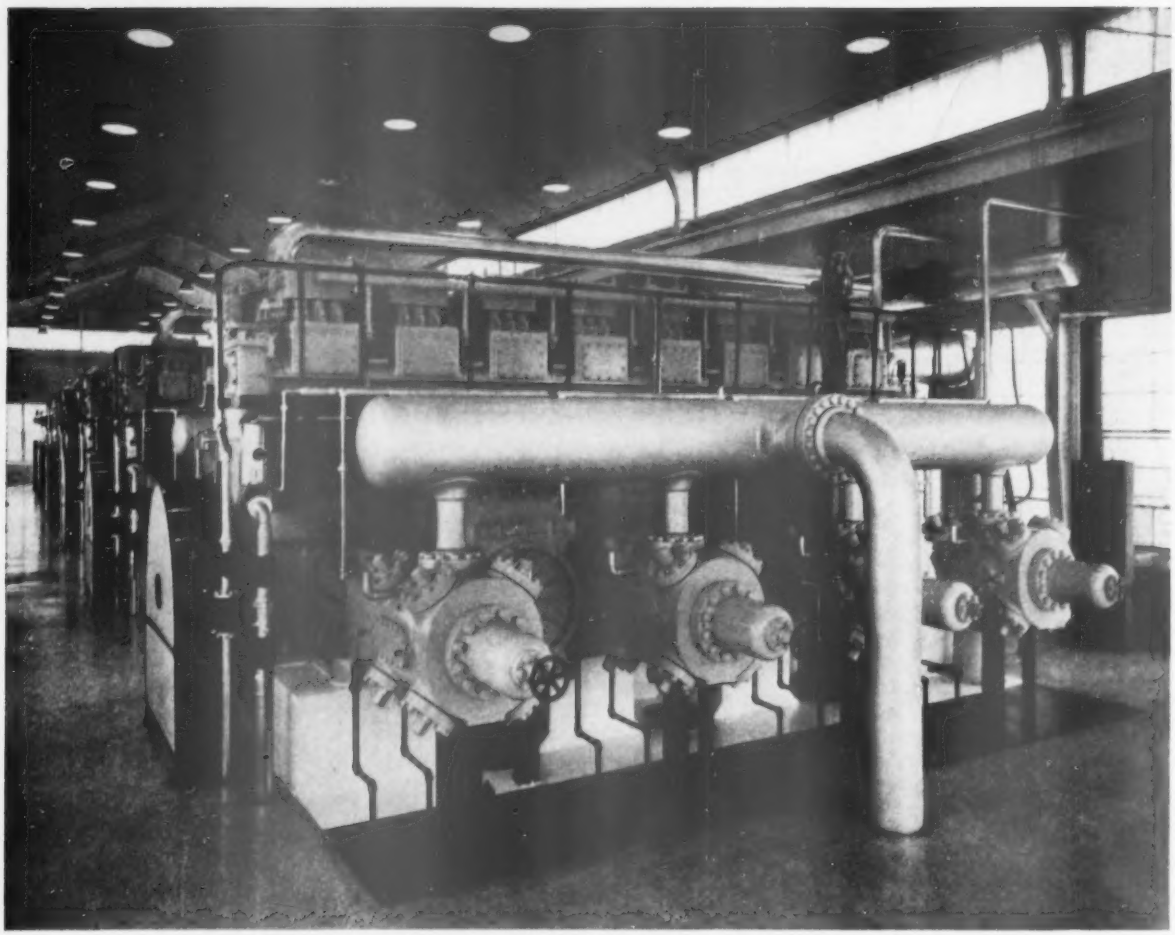
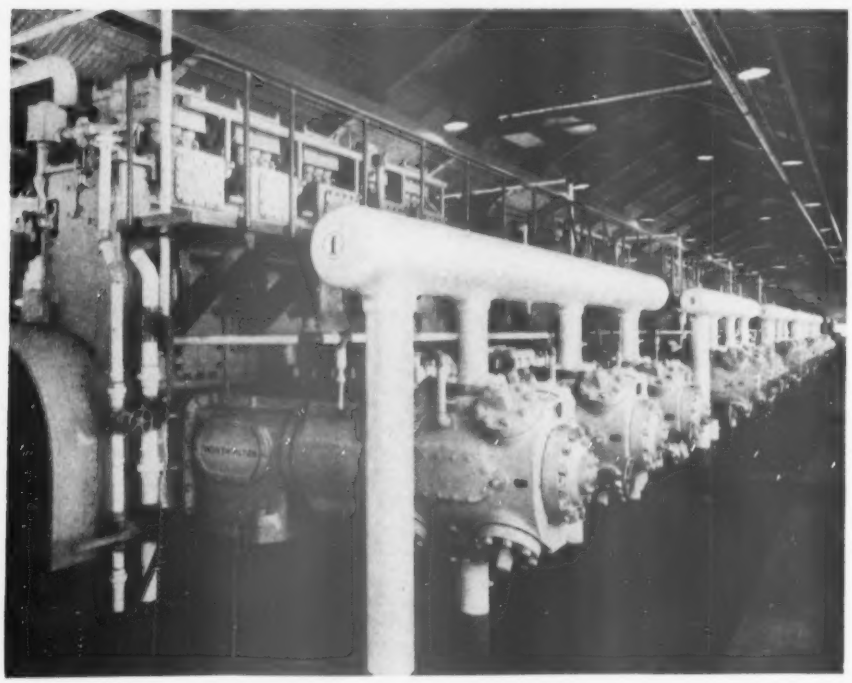


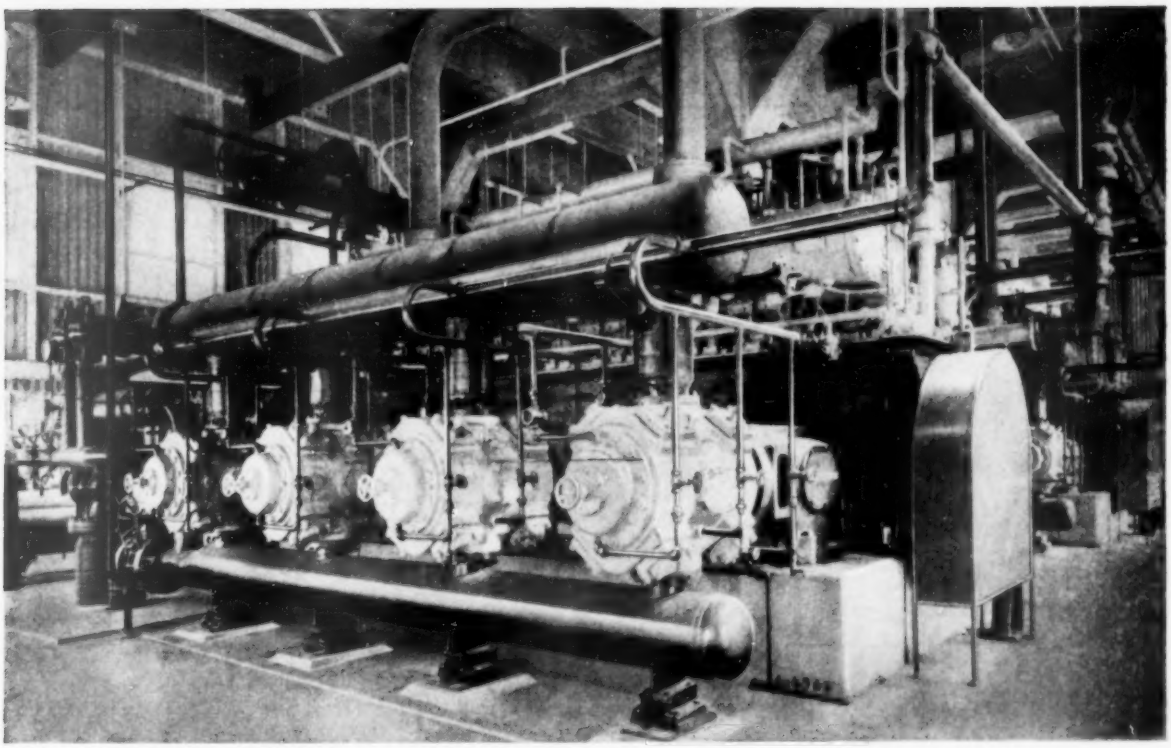
Fig. 6—Damaged surge gaps removed from insulating flanges adjacent to power line.



EFFICIENT WORTHINGTON UTC ENGINE-COMPRESSORS, like these of the Tennessee Gas Transmission Company, are fuelled by a tiny part of the gas they compress. The UTC's range in size from 1,000 to 2,000 hp.



10,000 HORSEPOWER IS DELIVERED by these ten Worthington UTC Engine-Compressors in the Navajo Station of the El Paso Natural Gas Line. Two 2000-hp Worthington UTC compressors are planned for the company's pending expansion at this station. They will handle a total of 687,000,000 cubic feet of gas when the installation is completed.



THE TEXAS COMPANY compresses propane for refrigeration purposes with two 1000-hp Worthington LTCH Engine-Compressors at their Port Arthur, Texas plant. The LTCH's range in size from 440 to 1100 hp.

Here are the right units for any gas compression job

• More and more leading names in industry are turning to Worthington UTC Uniflo and LTCH Angle Gas-Engine Compressors as the most dependable and efficient means of compressing gas.

The installations shown here are just three of the many Worthington-equipped plants throughout the country. The long, dependable service these plants have obtained from their Worthington equipment is responsible for the fine reputation the UTC's and LTCH's have earned.

Performance reports show that the operating economy of these units, under conditions of fluctuating gas flow and pressure, is unsurpassed. That's because over half a century of testing and research has made Worthingtons the finest compressors obtainable.

In addition to pipeline gas compression, the versatile UTC's are in operation on many other jobs such as pressure maintenance in oil wells, varied service in natural gasoline plants, processing petro-chemicals from natural gas, general process work, and many refrigeration applications.

Find out how a Worthington UTC or LTCH can improve your gas compression operations. Get in touch with your nearest Worthington district office or write directly to Worthington Corporation, Engine Division, Section EK.3.5, Buffalo, N. Y. EK.3.5

WORTHINGTON

ONLY WORTHINGTON COMPRESSORS GIVE YOU FEATHER VALVE PERFORMANCE

Y-Type • Engine-Starting • Horizontal • Portable • Radial • Gas Engine

EQUIPMENT MEN . . . in the News

Ballard Promoted By Exploration Surveys

W. Paige Ballard has been appointed divisional sales representative for the Texas - Louisiana area of Exploration Surveys, Inc., of Dallas.

Ballard is a graduate of Massachusetts Institute of Technology where he received his B. S. degree in mechanical engineering in 1937. Later he served in the production-engineering section of Atlantic Refining Co.'s producing offices in Dallas, where he helped to pioneer more efficient recovery techniques and cementing operations.

Alvey Conveyor Names Burton Sales Manager

Appointment of Calvin A. Burton to the position of general sales manager for Alvey Conveyor Manufacturing Co., St. Louis, has been announced by John M. Alvey, president, effective January 1, 1954.

Burton has been associated with the conveyor industry for 30 years in engineering, sales, and executive capacities. His appointment brings to Alvey a rich background of material-handling experience and knowledge. Burton will be located at St. Louis.

Mid-Continent Opens New Store in Edmonton, Alta.

Mid-Continent Supply Co. held the formal opening of its Edmonton, Alta., Canada, store in early October. Some 1,000 guests attended an open house to celebrate completion of the new installation.

Attending the event from Fort Worth headquarters of the organization were: D. H. Thornbury, executive vice president; H. D. Powell, tubular manager; T. P. Tarwater, general division manager; P. Z. Hilliard, director of purchases; R. O. Moore, merchandise manager; W. E. Trammell, I.B.M. accounting manager; J. H. Kenyon, assistant machinery sales, and Victor LeMay, director of public relations.

On hand from Calgary, Alta., division offices of Mid-Continent Supply Co. were R. L. Harris, division manager, and G. A. Metz, division machinery manager.

Operation of the Edmonton area is under the direction of C. W. Crabtree, district manager. Store manager is Wellington Sabo, and F. M. Wilson, W. B. Cruse, and R. H. Martin are his field salesmen. Storemen include: R. C. Waller, D. F. Law, D. E. Ostrosser, J. L. Kenny, R. K. Schwarz, and L. C. Hunt. Business-records department employes include: H. L. Ruffin, R. J. Perras, Sylvia Smith, Sylvia Barker, and Helen Sywolos. James Burns completes the personnel roster.

Mid-Continent Supply is equipped to outfit an entire drilling operation from Edmonton store stocks, with materials on hand for the complete rigging up of drilling rigs. An entire stock of parts for Emsco slush pumps is available at the Mid-Continent Edmonton store. Unit Rig & Equipment Co. draw works are also carried in stock at the Edmonton store. Other machinery items necessary to the operation of a drilling rig are available from stock in the Edmonton store.

Newest store of Mid-Continent Supply Co. located in Edmonton, Alta.

Edward Valves Appoints New District Manager

Edward Valves, Inc., has announced the appointment of Rex E. Galloup as district manager for the Texas and Gulf Coast area. A subsidiary of Rockwell Manufacturing Co., Pittsburgh, Edward Valves manufactures cast and forged-steel valves for the power and petroleum industries. Galloup was formerly sales manager for Oil Center Tool Co., Houston. He is a graduate of West Texas State College with a degree in business administration. His chief responsibility as district manager will be to direct sales of Edward Valves' new Mudwonder valve, designed particularly for mudline applications. His headquarters will be in Houston.

Fluid Packed Pump Announces Promotions

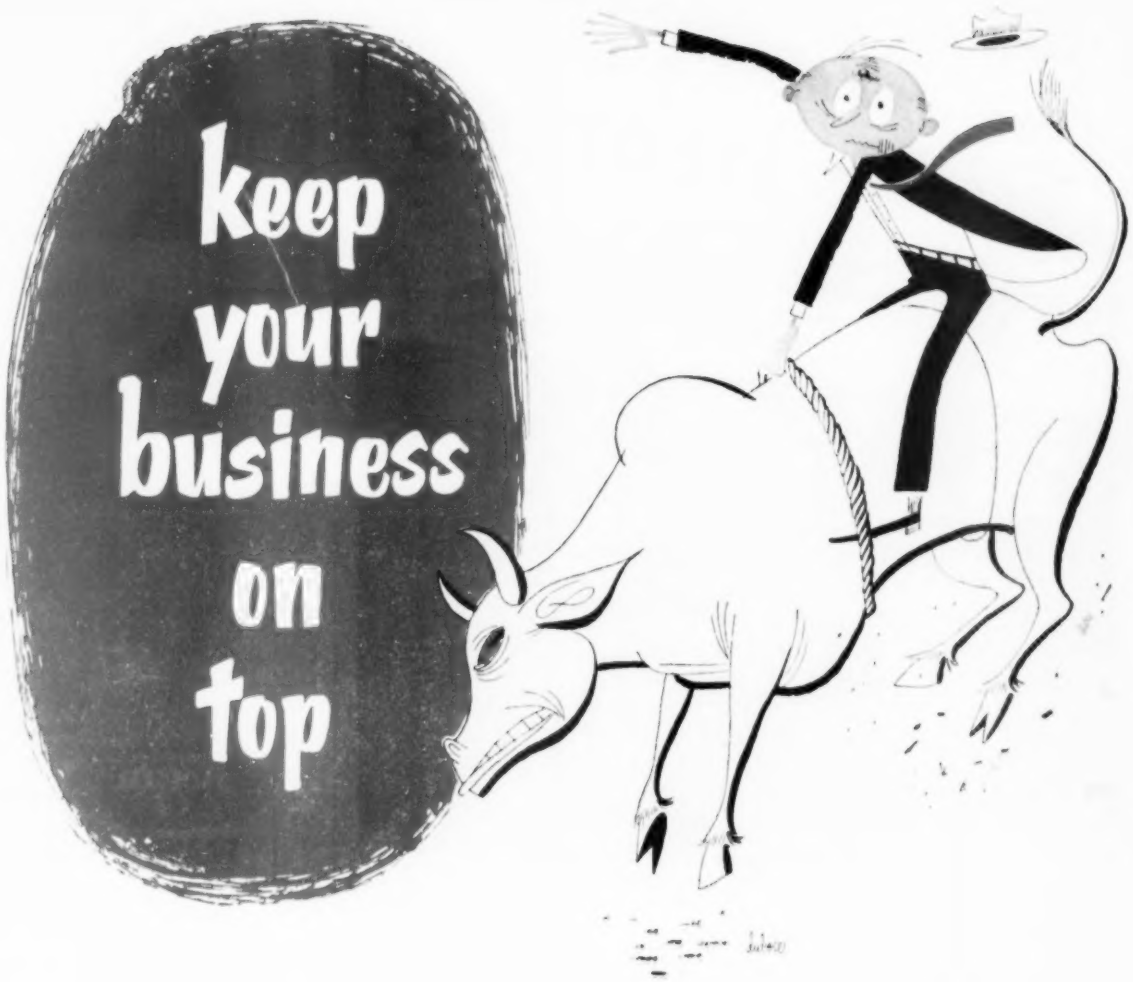
Sidney Shuman, general sales manager, Fluid Packed Pump Co., has announced that L. W. (Doc) Crow, formerly Fluid Packed Pump salesman in the tristate area, has been made manager of the eastern division. D. H. (Don) Vandenberg, who formerly served as assistant plant foreman, has been put in charge of West Texas, Texas Panhandle, and New Mexico operations.

L. W. CROW

VANDENBERG

I.H. Names Carlson as Dallas Area Sales Manager

The appointment of H. R. Carlson, of Dallas, as territory sales manager was recently announced by I. P. Payne, manager of sales for International Harvester's industrial power division. According to Payne's announcement, Carl-



Expert financial counsel is a must
for the successful continuation of a business.
At The National Bank of Commerce officers actually work for each of our
industrial depositors, using their accumulated, specialized
financial experience to help you. This expert guidance is at your service when
you make The National Bank of Commerce the bank for your company.
So, keep your business riding smoothly by taking advantage
of the broad experience of The National Bank of Commerce of Houston.

THE NATIONAL BANK OF COMMERCE

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Gulf Building, Houston, Texas "The Bank for All the People"

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

Leading Oil Companies Use
STRUTHERS WELLS
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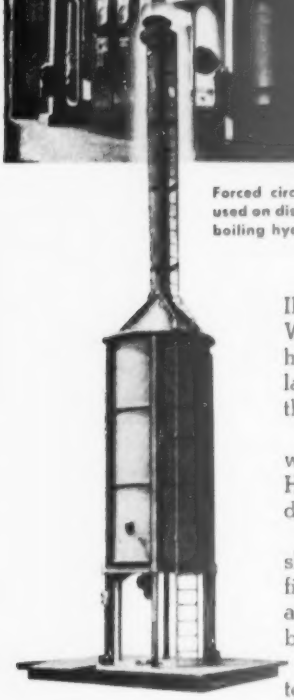
FOR ▶ Rich Oil Heating for Gasoline Plant Service • Indirect Heating for Grease Kettles • Steam Superheating • High Temperature Gas Heating • Dehydration Equipment • Petrochemicals • Asphalt Heating

Forced circulation Dowtherm heating unit, used on distillation equipment in which high boiling hydrocarbons are handled.



Shop assembled oil heater used for indirect heating of grease kettles, at plant of a leading oil company.

Illustrated are a few of many uses of Struthers Wells direct fired heaters. Where indirect heating is used with these heaters, the circulating medium may be oil or Dowtherm, with the Dowtherm used in vapor or liquid phase.

Heating systems may be supplied complete with all instruments, controls and burners. High thermal efficiencies may be secured, if desired, using finned tube convection surface.

Heaters to about 10,000,000 Btu may be shipped completely assembled and ready for field erection, except for structural platforms and stacks. Larger units are field assembled, but require a relatively small amount of labor.

Quick deliveries are available in an extensive line of standard sizes.

Struthers Wells

Write for Cat. C-45 on your letterhead, please.

STRUTHERS WELLS CORPORATION
WARREN, PA.
Plants at Warren and Titusville, Pa.
Representatives in Principal Cities

STANDARD
OF THE
PETROLEUM INDUSTRY
Since 1905

Regan type A
TRAVELING BLOCKS

. . . built for hard, rugged use under the most strenuous conditions. Supporting members in which bearings are housed and to which load is transferred are solid, 2" thick steel slabs. They provide part of the weight which gives the blocks a free-running movement in falling with no load. Helps to spool the wire line easily on the draw works drum when going up light. Expert workmanship makes all parts interchangeable. Regan time proven dual bearings with integral pins rotating with the sheave. Sizes from 160 ton to 300 ton capacity.

Write for special bulletin.

52

Regan
Forge & Engineering Co.
SAN PEDRO, CALIF.
FORT WORTH, TEXAS
Exclusive Mid-Continent and Export Distributor:
MID-CONTINENT SUPPLY CO.
General Offices: Fort Worth, Texas
Quality - Wrought on the Forge of Experience

son will make his headquarters at Dallas and will supervise the company's industrial-sales activities in a territory comprised of Oklahoma and the eastern half of Texas. Three International industrial distributors: Browning-Ferris Machinery Co., of Dallas, Greggton, and Houston; The Clarence L. Boyd Co., of Tulsa and Oklahoma City; and Jess McNell Machinery Corp., of San Antonio and Corpus Christi; serve the territory under Carlson's jurisdiction.

Ted Workman Advertising Promotes Pigg, Adams

Election of R. A. (Bob) Pigg to vice president, and Iris Adams to secretary - treasurer of Ted Workman Advertising, Inc., has been announced.

Pigg joined the advertising agency in 1948 and has been both production manager and an account executive. Before joining the staff of Ted Workman, he was advertising manager and publicity director for several companies in California and Texas and headed his own agency in Los Angeles.

In his new capacity, Pigg will continue to handle several accounts and will supervise other account work and production.

Iris Adams has been with the advertising agency since it was formed and has served successively as secretary to the president and as business manager.

Ted Workman Advertising, Inc., has specialized in oil - industry advertising for many years and numbers among its clients some of the largest service organizations, supply and equipment manufacturers in the industry.

Watson-Stillman Announces Large Expansion Program

A $250,000 expansion of plant and manufacturing facilities at Watson-Stillman Fittings Division, H. K. Porter Co., Inc., Roselle, N. J., has been announced by T. M. Evans, president.

The expansion program includes additional land, buildings, and the installation of specially designed machine tools for increased production of forged steel fittings. The new facilities when completed will greatly expand production and provide better service to customers.

The Porter company, through its various divisions, now manufacturers products for all segments of industry with Quaker Rubber Corp., Philadelphia, manufacturing industrial rubber products; Buffalo Steel Division, Tonawanda, N. Y., and Connors Steel Division, Birmingham, producing steel and light steel products; Delta-Star Electric Division, Chicago, designing and manufacturing high - voltage electrical equipment; Hinderliter Tool Co. Division, Tulsa, producing oil-field equipment; Watson-Stillman Co., Roselle, manufacturing hydraulic equipment; Leschen Wire Rope Division, St. Louis, producing wire rope and slings; and Watson-Stillman Fittings Division, Roselle, manufacturing forged-steel fittings.

Canada Fluor Gets Contract To Build Vancouver Plant

The Fluor Corp. of Canada, Ltd., Toronto, has been awarded a contract for the design and engineering, material procurement, and construction of a Standard Oil Development Co. Model IV fluid catalytic cracking unit to be built for Standard Oil Co. of British Columbia, Ltd., at its Vancouver, B. C., refinery, it has been announced by J. P. Wiseman, president of Fluor of Canada.

The unit will have a fresh-feed capacity of 3,750 bbl. per day. The proj-

AND WITH THE MONEY WE SAVE HAVING SECURITY UNDERGROUND STORAGE CO. INSTALL UNDERGROUND STORAGE, INSTEAD OF US DOING IT OR USING STEEL TANKS, WE CAN DECLARE AN EXTRA DIVIDEND!

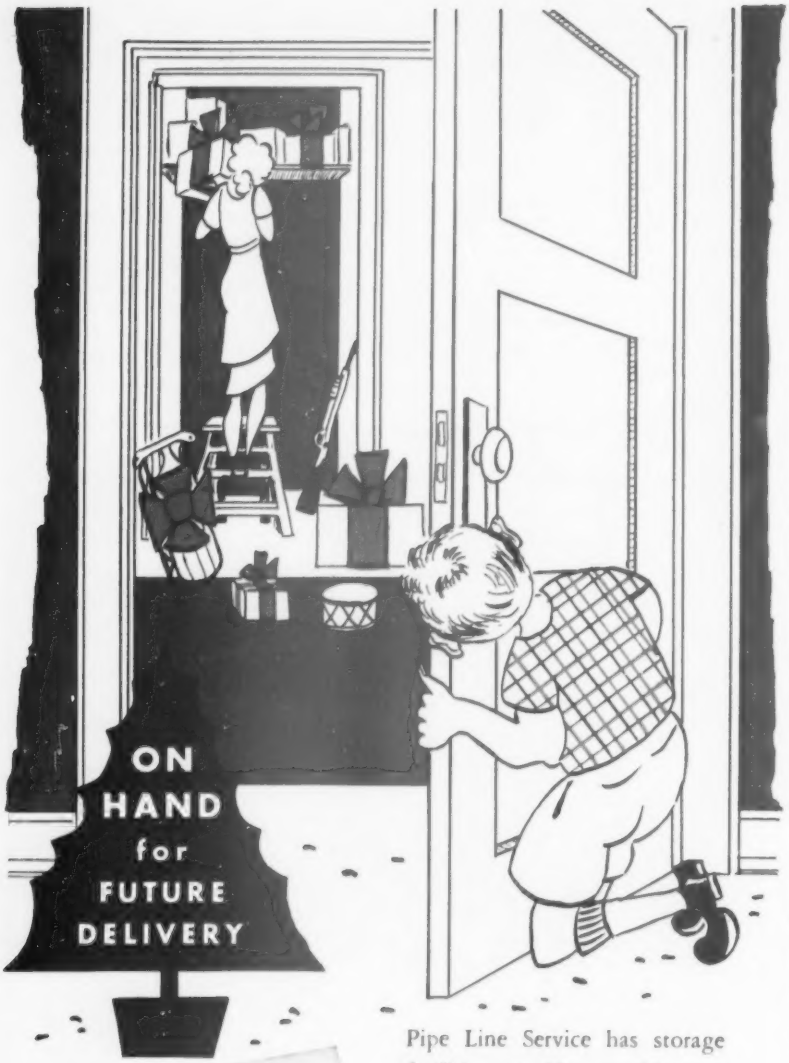
■ Don't delay — find out how underground storage can solve your storage problems. It's cheaper, safer and better. *Call or write . . . NOW!*

Smoky Pillar

SUS CO

SECURITY UNDERGROUND STORAGE COMPANY

PHONE 2-4067 615 SUNSET DRIVE WICHITA FALLS, TEXAS



Pipe Line Service has storage facilities, too. You can ship your pipe direct to PLS where it will be held for you until you want it cleaned, primed, coated and wrapped. For your convenience, acreage is provided for storage at all plants. Shown here is a partial view of the storage facilities at Franklin Park—typical of this extra service.

PLS

PIPE LINE SERVICE CORPORATION

Pioneers in Steel Pipe Protection

General Offices and Plant • Franklin Park, Illinois

Plants at Glenwillard, Penna.; Longview, Texas; Corpus Christi, Texas; Harvey, La.; and Sparrows Point, Md.

Dependable Service Since 1931

ect also will include facilities consisting of fractionation, gas recovery, and caustic-treating sections in conjunction with the Vancouver refinery's expansion.

Engineering work will get under way immediately and Flour will begin actual construction of the new unit in March 1954. Completion of the project is scheduled by October 1, 1954.

Berger Named By Lane-Wells To Industrial Relations

JESSE T. BERGER

In line with plans to improve and extend the scope of its employe welfare program in its 85 branches in the United States, Venezuela, and Canada, Lane-Wells Co. has appointed Jesse T. Berger, well-known industrial-relations executive, as manager of industrial relations, according to an announcement by Rodney S. Durkee, president.

Until recently Berger was director of industrial relations for Pacific Airmotive Corp. Previously, he had the same post with Stone & Smith, Inc., metal and electronics manufacturer of Vernon, Calif.

For 2½ years he was assistant chief of the industrial-relations division of the San Francisco port of embarkation working with 19,000 civilian employes. Previously, he had 10 years' experience with Standard Oil Co. of California.

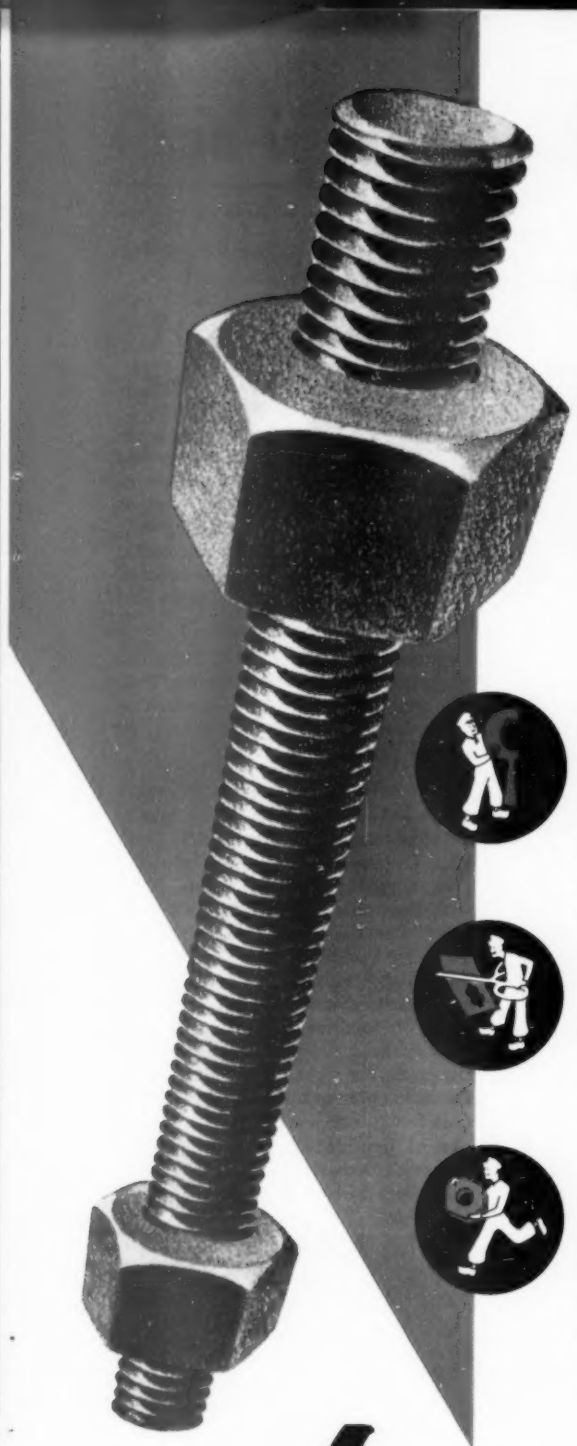
Appleton Electric Makes Wehrheim Sales Executive

F. W. WEHRHEIM

F. W. Wehrheim, a 33-year veteran with Appleton Electric Co., has been elected its vice president in charge of sales, Arthur I. Appleton, president, has announced.

Wehrheim joined Appleton Electric in 1920 as stock-control clerk, serving the company continuously in various sales capacities. He succeeds E. A. Murray, who has resigned to return to his former employer, American Steel & Wire Division of United States Steel Corp.

I. W. Strong, former Denver sales representative for Appleton, has been appointed assistant to the vice president in charge of sales.



Dutch industry makes American standard fasteners for the oil industry

QUALITY Five ultra-modern Dutch factories are banded together to produce the world-renowned VvS nuts and bolts made to American specifications. The fasteners industry of Holland has led in efficiency, dependability and precision for more than 100 years. The quality of Dutch VvS products is unsurpassed. Leading U. S. testing laboratories certify the quality of VvS products on *American standards* of metallurgy, dimensions and finish. For example, the oil industry in the United States and Canada is widely using Heat Treated and Oil Quenched VvS nuts. These products meet ASTM specifications A-194 of course, and are particularly outstanding in finish.

PRICE Dutch efficiency and dependability make it possible to supply VvS nuts anywhere in the world on a competitive basis. The oil industry has used fasteners from the VvS member factories since its very beginnings. American oil and gas industry purchasers of nuts, bolts and fasteners are invited to compare VvS price lists with any others.

DELIVERY VvS factory organizations take pride typical of the Dutch in their ability to meet delivery deadlines. Orders placed with Reynolds Fasteners, Inc., in America bring fast and dependable shipments from the stable VvS plants, where technician, craftsman and workman alike are given opportunities, incentives and working conditions ranking with the best Europe can offer. Plants and equipment facilities are being enlarged in pace with the steadily growing stream of business coming to VvS.

The exclusive Sales and Service Representative for VvS in the United States and Canada is

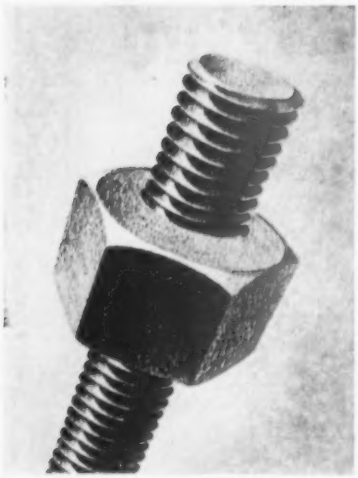
Reynolds FASTENERS, INC.

68 Wall Street
New York 5, N. Y.
Phone DIgby 4-7444
Cable REYNFAST, N. Y.

In Canada associated with
Kenway Metal Products, Ltd.
21 King Street East
Toronto 1, Ontario

(See next page)

Reynolds FASTENERS NEWS



ABSOLUTE QUALITY STANDARDS

VvS fasteners for the American oil and gas industries are produced strictly in line with ASTM standards as to metallurgy, dimensions, finish. Their qualities are verified by leading U. S. independent testing laboratories. American stud manufacturers are giving immediate and wide acceptance to VvS nuts of both Classes 2 and 2H. Their absolute quality is enhanced by unrivalled finish, including true washer surface and smooth outside surfaces, and a balanced hexagon shape.

VvS quality is the result of Dutch pre-eminence in the fasteners field. The VvS Heat Treated, Oil Quenched nuts are made on the famous Van Thiel hot pressing equipment, acknowledged to be one of the major advances in nut making. VvS craftsmen have the advantage of more than a decade of experience with this and other Dutch-developed equipment.

Currently Reynolds Fasteners is booking orders for VvS nuts in sizes of ¼-inch to 3½-inches. The VvS factories are equipped to supply the American market with *a complete range* of fasteners, including Hexagon Head Cap Screws in both 1020 and 1038 steel, in sizes from ¼-inch to 1½-inches; Hot Pressed Nuts from ¼-inch to 4 inches; Semi-Finished Nuts up to 4 inches; Machine Screws; Machine Screw Nuts; Socket Head Cap Screws, and other standard or special types of fasteners.

So diverse are the facilities of the five Dutch factories that inquiries on any type of nut, bolt or fastener are invited for study and prompt reply.

Do you know what Verkoopkantoor voor Schroefbouten N.V. means?

A workable translation for this marathon phrase, usually shortened to VvS, is *Combined Sales Organization of Bolt and Nut Factories in the Netherlands.*

VvS represents an alliance of virtually the entire Dutch bolt, nut and fasteners industry, a field in which the Netherlands has long been a leader. Five factories operate under the VvS banner, employing more than 2000 persons, each factory organization representing a modern, top-flight producer of fasteners. VvS means Sales and Service effectiveness, insurance of Quality and dependability of Delivery.

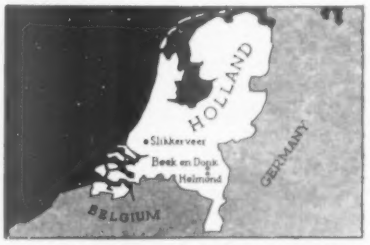
The combined sales efforts of the Dutch factories commenced in 1934. For nearly a score of years the teamwork of this precision industry group has earned for VvS the admiration and patronage of the most meticulous manufacturers and fabricators in the world.

ABOUT REYNOLDS FASTENERS, INC. As exclusive representatives for VvS in the United States and Canada, the Reynolds organization brings the American oil and gas industries a solid, nearby link between a pre-eminent supplier industry abroad and the men who establish the requirements and standards for equipment for oil fields, refineries, oil and gas process installations, storage, pipe lines, and distribution. American oil and gas facilities are designed to be the best anywhere. It is to this level of quality that VvS has gauged its production of American standard fasteners.

Reynolds personnel are well grounded technically, intimately informed and up-to-date on the qualifications of the VvS member factories and people. Moreover, the Reynolds people are experts in handling the import of precision products. Reynolds is an affiliate of long established firms which for years have specialized in the import of precision metal and engineering products—the best the world offers for American industry. Reynolds offices in New York, Toronto, Paris and The Hague provide sales and technical services for American fasteners applications anywhere in the world. The Reynolds staff is well qualified for rapid, accurate handling of mill orders which bring shipments direct from European ports to the North American ports of entry and railheads for suppliers to the oil and gas industries.

GETTING IN TOUCH WITH REYNOLDS Your inquiries as to details on VvS fastener products for your individual needs should be addressed to Reynolds Vice President for Sales, Mr. Binem Krygier, at the New York office. Mr. Krygier, a widely experienced and informed engineer, and his staff travel frequently in the oil and industrial capitals of the U. S. and Canada. They will schedule a visit to your office on one of the sales and service itineraries, at your convenience.

ABOUT PRICES Any buyer is very much interested in prices and in the case of items produced abroad wants to know why Dutch-made specialty products offer advantages of their own. Price-wise Reynolds believes the VvS products compete with the best. Further, the exclusive machinery and methods of the Dutch give a particularly accurate and beautifully finished product. The Dutch toolmakers of VvS can't be beat for advanced design and efficiency. If the prices are right, there just isn't any question about quality or delivery. VvS goes to work on a stable, agreed schedule of production and shipments. Reynolds experience with American customers will be laid before you for judgment.



Headquarters of VvS are at Helmond, Holland, where two of the factories are located; the other three factories are at Beek en Donk and Slikkerveer (see map sketch). VvS officials welcome visits of American industrialists at Helmond if you are traveling abroad. Let them know you are coming to see VvS showrooms and headquarters through Reynolds Fasteners, Inc.

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Pipe-Line Construction

PIPE-LINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipe-line companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by a • preceding the company name.

Crude-Oil Pipe Lines

• **California - Oregon Pipe Line System**—103 miles 6-in., proposed, Crescent City, Calif., to Medford, Ore.

• **Cities Service Pipe Line Co.**—60 miles, 12-in., planned, Houston to Sour Lake, Tex.

• **Gulf Refining Co.**—55 miles, 12-in., planned, Bay Marchand to Plaquemines, La.

Gulf Refining Co.—63 miles, 8-10-in., under way, Lea County, New Mexico, to Anderson and Denton fields. 1-54.

• **Magnolia Pipe Line Co.**—29 miles, 8-in., planned, Midland County, Texas area.

• **Michi, Inc.**—10-in., planned, Highland, Ind. to Kalamazoo, Alma, and Elsie, Mich.

• **Pasotex Pipe Line Co.**—146 miles, 10-in., planned, Snyder to Wink, Tex. 2-1-54.

Phillips Pipe Line Co.—18 miles, under way, gathering lines, northeast area of Andrews County, Texas.

• **Progress Pacific Pipeline Co.**—1,100 miles, 24-in., planned, Odessa, Tex., to Los Angeles, Harbor, Calif.

• **Roosevelt Oil & Refining Corp.**—22 miles, 4 and 6-in., planned St. Helen to Norwich, Mich.

Sinclair Pipe Line Co.—45 miles, 18-in., under way, Panova to Cushing, Okla. O. R. Burden Const. Corp. Completion date 12-53.

• **Sinclair Pipe Line Co.**—20 miles, 12-16-in., planned, Monee to Blue Island, Ill. Completion date 4-54.

Texas New Mexico Pipe Line Co.—52 miles, 10-in., contracted, Dawson County to Basin System, McVean & Barlow.

Texas Pipe Line Co.—34 miles, 6-in., under way, Sour Lake to Port Arthur, Tex. Houston Contracting.

45 miles, 8-10-in., under way, between Erath and Bayou Sale stations. Houston Contracting Co.

65 miles, 4-6-8-12-in., under way, South Louisiana. Panama-Williams.

Golden Meadow to Houma, La. Panama-Williams.

Gathering lines in Leeville, Bay De Chene and Golden Meadow pools. Panama-Williams.

• **West Coast Pipeline Co.**—960 miles, 20-22-in., planned Wink, Tex., to Norwalk, Calif.

Products Pipe Lines

Augusta Pipe Line Co.—43 miles, 8-in., under way, from Arkansas City to Augusta, Kans. Ray L. Smith & Son, Inc.

Badger Pipe Line Co.—215 miles, 8-10-12-in., begin Spring '54, East Chicago, Ind., to Madison, Wis. (Joint project of Cities Service Oil Co., Sinclair Pipe Line Co., Pure Oil Co., and The Texas Co.)

• **H. W. Bass & Sons, Inc.**—152 miles, 4-6-in., proposed. Duval and Live Oak counties, Texas, to Corpus Christi, Tex.

• **Great Lakes Pipe Line Co.**—Proposed extension 130 miles, Nebraska City to Grand Island, Neb.

Harbor Products Systems—86 miles, 16-in., under way, Woodbury Junction, Philadelphia to Trembley Point, N. J. Construction Service Co. and H. C. Price Co. (Joint ownership of Sinclair Pipe Line Co., Gulf Refining Co., and Texas Pipe Line Co. Completion date 1-54.

• **International Pipe Line, Inc.**—132 miles, 8-in., proposed, Wrenshall to Minneapolis, Minn.

Oklahoma Mississippi River Products Line, Inc.—475 miles, 12-in., under way, Duncan, Okla., to West Memphis, Ark. Ford, Bacon & Davis Const. Corp.

West Memphis, Ark., to White River, Williams Bros. 12-31-53.

Under way, White River to Allen, Okla. River Const. Co. Completion date 6-30-54.

Under way, Allen to Duncan, Okla. River Constr. Corp. Completion date 6-30-54.

• **Phillips Petroleum Co.**—54 miles, 6-in. planned, Goldsmith to Borger, Tex.

52 miles, 10-in., planned, Shell's Brookshire system to Sweeny, Tex.

• **Triangle Pipe Line Co.**—560 miles, proposed, Arkansas City, Ark., to Covington, Ky., and Nashville, Tenn.

U. S. Gov't. Alaskan Products Pipe Line.—600 miles, 8-in., under way, Haines northward through British Columbia and Yukon to Fairbanks, Alaska. Williams Bros., McLaughlin, Inc., and Marwell Const. Co. Completion date 9-55.

• **United States Pipe Line Co.**—1,799 miles, 22-26-in., proposed, Beaumont, Tex., to Newark, N. J.

Beaumont, Tex., to Memphis, Tenn.

Memphis, Tenn., to Louisville, Ky.

Louisville, Ky., to Newark, N. J.

Laterals to Paducah and Lexington, Ky.

Williston Basin Pipe Line Co.—250 miles, 8-in., under way, Laurel-Billings, Mont., refineries to Glendive, Mont.

Wolverine Pipe Line System—200 miles, 14-in., under way, Chicago-Toledo-Detroit (Joint ownership of Shell, Texas, and Cities Service.) Anderson Bros. and Midwestern Constructors, Inc. Completion date 1-54.

East Chicago, Ind. to Kalamazoo River. Midwestern Constructors, Inc.

Yellowstone Pipe Line Co.—(Continental Oil Co., Interstate Oil Pipe Line Co., Union Oil Co., and H. Earl Clack interest) 540 miles, 10-in., contracted, Billings, Mont., to Spokane, Wash. 9-54.

Billings to Bozeman, Mont. Ross and Powers.

Bozeman to Helena and on to Clinton, Mont. Associated Pipe Line Contractors, Inc.

Clinton to Perma, Mont. Associated Pipe Line Contractors, Inc.

Clinton to Perma, Mont. Eastern Pipe Line Fields Service Co.

Perma, Mont., to Murray, Idaho. Eastern Pipe Line Field Service Co.

Murray, Idaho to Spokane, Wash. Engrs. Limited Pipe Line Co.

Natural-Gas Pipe Lines

• **America-Louisiana Pipe Line Co.**—1,000 miles, 30-in., proposed, Lowry, La., to Detroit, Mich.

• **Arkansas - Missouri Power Co.** — 140 miles, 2 to 10-in., planned, St. Francis River, Clay County, Arkansas, to near Campbell, Mo.

• **Associated Natural Gas Co.**—88 miles, proposed, Missouri.

• **Atlantic Seaboard and Virginia Gas Transmission.**—116 miles, 26-in., proposed, loops along Cobb, W. Va., to near Baltimore, Md.

Buzzards Bay Gas Co.—28 miles, 8-in.,

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8" and 12" Line

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300,000' 8⅝" O.D. .322 Wall, 28.55# Lapweld.

270,000' 12¾" O.D. .375 Wall, 49.56# Lapweld.

All machine cleaned, commercially straight, 20' single random lengths, ends beveled. Used first class condition. Suitable installation oil, water or gas pipe line systems 850# to 900# P.S.I. Priced attractively for prompt shipment Welda, Kansas and Grandview, Missouri.

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REDA PUMPS

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The lower the expense of producing source water from wells for water flooding operations, the greater the ultimate profit.

Reda Pumps for source water wells provide many ways for lowering these production costs.

Improved design and longer operating life *lower* the cost of labor per barrel, *lower* the cost of maintenance per barrel, *lower* the investment cost per barrel, *lower* the cost of fluid per barrel.

Also the ability of Reda pumps to produce greater volumes in limited casing sizes and from greater depths often reduces the number of source water wells required.

Reda engineers have long been associated with water flooding operations and are fully qualified to assist operators in discussing their source water requirements.

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PUMP COMPANY
BARTLESVILLE, OKLA.

contracted, Hyannis, Mass., to Bourne Bridge, Mass. Hallen Co., Inc.

• **Carolina Natural Gas Corp.**—185 miles, 2-12-in., proposed, lateral lines off Transcontinental in North and South Carolina.

• **Chicago District Pipe Line Co.**—31 miles, 24-30-in., proposed, East bank of Des Plaines River southwesterly to near Hodgkins Ill., on through Cook County to Will County, Illinois.

• **Cities Service Gas Co.**—18 miles, 16-in. Lawrence and Newton counties, Missouri.

69 miles, 20-16-in., planned, Cleveland, McClain, and Garvin counties, Oklahoma.

• **City of Fayette, Ala.**—20 miles, 5-in., proposed, Fayette, Ala., to Southern Natural's system in Tuscaloosa County, Ala.

City of Dallas, Ga.—8 and 4½-in., distribution system. Engineering & Const. Co., 1954.

• **Coast Counties Gas & Electric Co.**—40 miles, 3, 4, and 8-in., planned. Coast and Valley region, California.

• **Colorado Interstate Gas Co.**—365 miles, 22-in., proposed, Green River, Wyo., to Denver, Colo. 1954.

49 miles, 20-in., proposed, Morton County, Kansas, to near Hooker, Okla.

Colorado Interstate Gas Co.—70 miles, 20-4-in., under way, gas-gathering system in Kansas. Engineering & Const. Co. 1-1-54.

243 miles, 4 to 20-in., under way, Colorado, Oklahoma, Texas, and Kansas. Engineering Const. and Z. J. Graham.

• **Cumberland and Allegheny Gas Co.**—31 miles, 12-in., proposed, Garrett County, Md., to Keyser, W. Va.

East Tennessee Natural Gas Co.—96 miles, 16-in., under way, Knoxville, Tenn., to Kent line. Engineering & Const. Co. 1-1-54.

54 miles, 4-12-in., under way, laterals off main line from Knoxville, Tenn., to Kent line. Engineering & Const. Co. 1-1-54.

• **El Paso Natural Gas Co.**—1,178 miles, proposed, Permian basin, New Mexico, Texas and Colorado.

El Paso Natural Gas Co.—771 miles, 30-in., under way, Plains, Tex. to Kingman, Ariz.

Section 1—Under way, Plains, Tex., to Corona, N. M. Oklahoma Const. Co.

Section 2—Under way, Corona to Suwanee, N. M. R. H. Fulton.

Section 3—Under way, Suwanee to Gallup, N. M. R. H. Fulton.

Section 4-5—Under way, edge of Navajo Reservation east to Flagstaff on to Kingman, Ariz. Western Pipe Line Const. Inc. Completion date 2-54.

Under way, across Navajo Reservation connecting sections 3, 4, and 5. El Paso Co. crews.

Under way, Spraberry fields, El Paso Co. crews.

• **Fort Worth Basin Gas Co.**—Planned, Novice, through Brown and Comanche counties, Texas.

• **Glacier Gas Co.**—285 miles, 20-in., proposed, Kalispell, Mont., to Spokane, Wash.

120 miles, 16-in., proposed, Spokane to Hanford, Wash.

91 miles, 8⅝-in., proposed, Spokane to Lewiston, Idaho.

130 miles, 12¾-in., proposed, Spokane to International boundary at Trail, British Columbia.

Gulf Interstate Gas Co.—860 miles, 30-in., under way. Acadia Parish, La., to Boyd County, Ky. H. C. Price and Houston Contracting. 11-54.

Under way, Rayne, La. to Kincade, Tenn. Houston Contr.

Under way, Gordonsburg, Tenn., to Carlettsburg, Ky. H. C. Price Co.

230 miles, gathering lines, under way. Associated Pipe Line Contractors, Anderson Bros., Williams Bros.

329 miles, 12 to 24-in., proposed. Laterals off Acadia Parish, Louisiana, to Boyd County, Kentucky, line.

• **Home Gas Co.**—32 miles, 12-in., planned, Breesport to Union Center, N. Y.

17 miles, 12-in., proposed, loops from Hansock to Sanford, N. M.

Houston Pipe Line Co.—43 miles, 24-in., under way, Edna to Wharton main line. Panama-Williams. 12-15-53.

• **Interstate Power Co.**—26 miles, 8-in., proposed, from Nat. Gas P. L. Co. America line near Hooppole, Ill., to Clinton, Ia.

Iowa-Illinois Gas & Electric Co.—41 miles, 10-in., under way, Washington County to Cedar Rapids, Iowa.

• **Kansas-Nebraska Natural Gas Co.**—41 miles, 10-12-in., proposed, Kansas and Nebraska.

41 miles, proposed, Albion, Arcadia, and Broken Bow, Neb.

• **Lone Star Gas Co.**—100 miles, proposed, storage fields to the Dallas-Fort Worth area.

35 miles, 12-in., proposed, southeastern Schleicher County.

Lone Star Gas Co.—44 miles, 12-in., under way, Red Springs, Woods County to Sulphur Springs area, Hopkins County, Texas.

36 miles, 12-in., under way, Stamford to Abilene, Tex. Company crews. Completion date 12-53.

• **Manufacturers Gas Light & Heat Co.**—40 miles, proposed, Allegheny, Washington, and Beaver counties, Pennsylvania.

213 miles, 3 to 26-in., proposed, various points on system in Pennsylvania, West Virginia, and Ohio.

72 miles, 16-20-in., proposed, Doddridge, Wetzel and Marshall counties, West Virginia.

• **Mississippi River Fuel Corp.**—109 miles, 10-18-in., planned, laterals in Woodlawn and Waskom gas fields, Texas.

Missouri Central Gas Co.—25 miles, 6-in., contracted, Moberly to Macon, Mo. L. R. Young Const. Co.

• **Missouri Public Service Co.**—136 miles, 8-10-in., proposed, New Franklin to Trenton, Mo.

24 miles, 10-in., Johnson County to Clinton, Mo.

• **Montana Power Co.**—52 miles, 16-in., planned, Canada - Montana border to Cut Bank, Mont.

• **Morganfield Natural Gas Co.**—31 miles, 4-6-in., planned, through Sturgis, Providence, Clay, Diamond, Wheatcroft, and Sullivan, Ky.

• **Natural Gas Producer Inc.**—100 miles, 12-in., planned, Yenter pool to Denver, Colo.

Nevada Natural Gas Pipe Line Co.—114 miles, 10¾-in., under way, Topock, Ariz.,

"Naw, I never go into town no more—But I suppose that little restaurant on Main Street still serves all you can eat for a quarter."

Allis-Chalmers OILFIELD Engines

THEY LAST LONGER

FRED E. COOPER INC. TULSA
HOUSTON · ODESSA · LOS ANGELES
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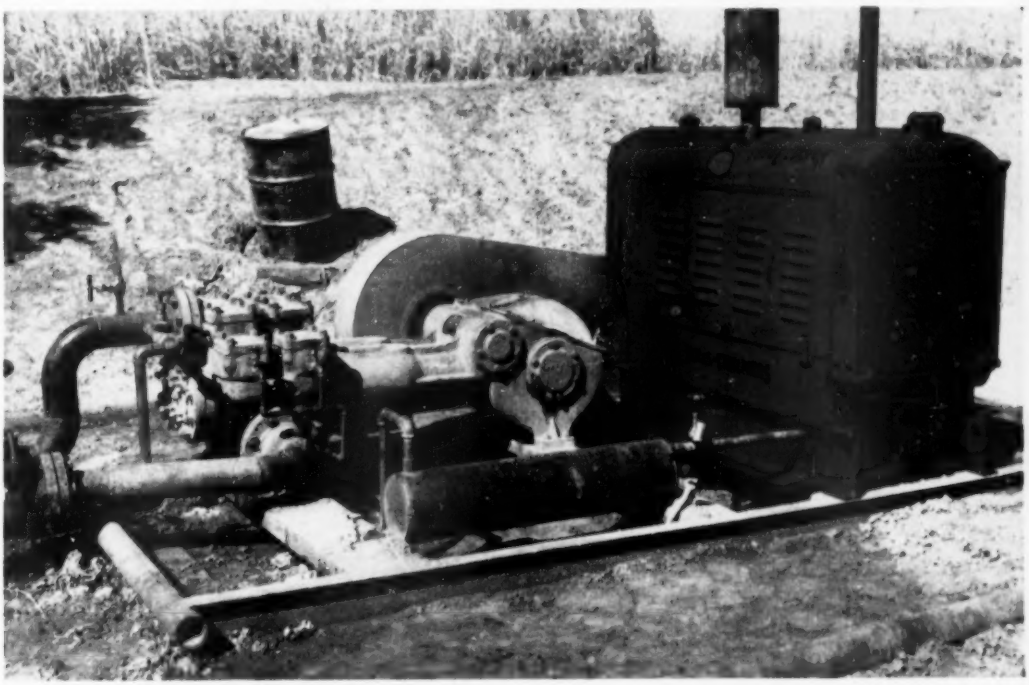

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E563 Allis-Chalmers power unit No. 42989
Installed in 1948
Hours of operation to date — 35,200
Barrels of oil pumped, more than 8,800,000

This engine has not had any overhaul, the only repairs having been minor items such as oil filter elements and spark plugs.

Such performance as this is the reason that more and more value conscious users are selecting Allis-Chalmers power.

Allis-Chalmers' modern design features, such as removable cylinder sleeves of long wearing alloy iron and valve in head construction, assure you of years of dependable service. Most repairs, when finally required, can be quickly and economically made at the location.

COMPARE

1. Allis-Chalmers Quality
2. Allis-Chalmers First Cost
3. Allis-Chalmers Parts Cost

With those of any other engine.

FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Houston, Odessa, Los Angeles

to Las Vegas, Nev. R. H. Fulton. Completion date 1-1-54.

• **New River Gas Co.**—50 miles, planned. Summers to Monroe counties, West Virginia, to Narrows and Dublin, W. Va.

• **Northeastern Gas Transmission Co.**—22 miles, 8-in., planned, Upton, Mass., to Pawtucket, R. I.

• **Northern Indiana Fuel & Light Co.**—35 miles, 8-in., planned, Edgerton to Auburn, Ind.

• **Northern Natural Gas Co.**—458 miles, proposed, Kansas, Texas, Oklahoma, and Nebraska, Iowa and Minnesota to connect with Permian Basin System.

475 miles, proposed branch lines to Iowa, Nebraska, Minnesota and South Dakota.

• **Northwest Alabama Gas District**—40 miles, 9-in., proposed, Southern Natural's line through Winfield to Haleyville, Ala.

• **Northwest Natural Gas Co.**—750 miles, planned, Washington, Oregon, and Idaho.

24-in., Eastport, Idaho, to Monroe, Wash.

18-in., Monroe to International boundary near Lynden, Wash.

22-in., Monroe to near Seattle, Wash.

20-in., Seattle to Portland, Ore.

• **Ohio Fuel Gas Co.**—31 miles, 20-in., planned, Licking County to Richland County, Ohio.

22 miles, 16-in., planned, Dayton, Troy, Piqua, and Sidney, Ohio.

23 miles, 16-20-in., planned, Wellington to Elyria, Ohio; 16 miles, 20-in., planned, Benton Station to Crawford Station; 18 miles, 20-in., Crawford Station to near Columbus; 16 miles, 16-in., planned, Berlin to Sandusky, Ohio.

74 miles, 3 to 20-in., planned, Hocking, Knox, and Ashland counties, Ohio.

47 miles, 20-in., planned, Benton Township, Hocking County, to Columbus, Ohio.

61 miles, planned, northern and southwestern Ohio.

33 miles, 20-in., proposed, Jefferson to Seneca, Ohio.

69 miles, 20-24-in., proposed, lines to tiein Gulf Interstate line along various points in Lawrence, Jackson, Vinton, Hocking and Fairfield counties, Ohio.

• **Pacific Gas & Electric Co.**—50 miles, 12-16-20-in., planned, Fresno to Merced, Calif.

(Section 2) 20-in., Holm to Topock-Milpitas line.

(Section 3) 12-in., parallel existing Madera-Livingston line, planned. Napa Wye to Shellville; Cotati to Santa Rosa, Calif.

129 miles, 31-in, proposed, main-line loops along Topock, Ariz., to Milpitas, Calif. Completion date 11-54.

Pacific Gas & Electric Co.—88 miles, 34-in., under way, portions of 34-in. Topock-Milpitas pipe line. Completion date 4-15-54.

• **Pacific Northwest Pipeline Corp.**—1,466 miles, proposed, Ignacio, Colo., to Bellingham, Wash.

380 miles, proposed, laterals and spurs off main line to Pocatello, Idaho, to Yakima, Wash.

Permian Basin Pipeline Co.—280 miles, 16-24-26-30-in., under way, West Texas and New Mexico. R. H. Fulton & Co.

• **Rockland Light & Power Co.**—22 miles, 8-in., proposed, Orangetown to Tompkins Cove, N. Y.

• **Shenandoah Gas Co.**—39 miles, 3-4-8-in., proposed, Middleton, Va., to Martinsburg, W. Va.

South Carolina Gas & Electric Co.—160 miles, 16-12-10-in., under way, Aiken, S. C., to cities of Columbia, Summerville, and Charleston, S. C. Williams Bros. Completion date 1-54.

• **South Georgia Natural Gas Co.**—339 miles, 2-12-in., planned, Phoenix, Alta., to Tallahassee, Fla. (a) 12-in., Phoenix, Ala., to Albany, Ga., (b) 10-in., Albany, Ga., to Moultrie, Ga., (c) 8-in., Moultrie, Ga., to Tallahassee.

Southern California Gas Co., and Southern Counties Gas Co.—73 miles, 30-in., under way, loops on main line from Blythe to Los Angeles. River Const. Co. 1-54.

Southern Natural Gas Co.—1,235 miles, 24 to 4½-in., under way, Louisiana, Mississippi, Alabama, and Georgia, and South Carolina. Houston Contracting, Latex and H. C. Price. Fall 1953.

Gwinville to Pickens. Completion in 1954.

Gwinville, Miss., to Ellerslie, Ga. Completion in 1954.

• **Southwest Gas Corp., Ltd.**—26 miles, proposed, from P.G.&E. line to Victorville, Calif.

• **Tennessee Gas Transmission Co.**—571 miles, 30-in., planned, Kinder, La., to Portland, Tenn.

67 miles, 30-in., planned, loops in Texas and Louisiana.

63 miles, 26-in., planned, loops in Ohio and Pennsylvania.

58 miles, 20-in., planned, Louisiana Gulf Coast to Station No. 507 near Kinder, La.

100 miles, laterals in Texas.

45 miles, 20-in., proposed, Buffalo, N. Y., to the U. S.-Canadian border Hamburg station near St. Catherines.

Undetermined, 24-in., planned, Mercer, Pa., to New York City.

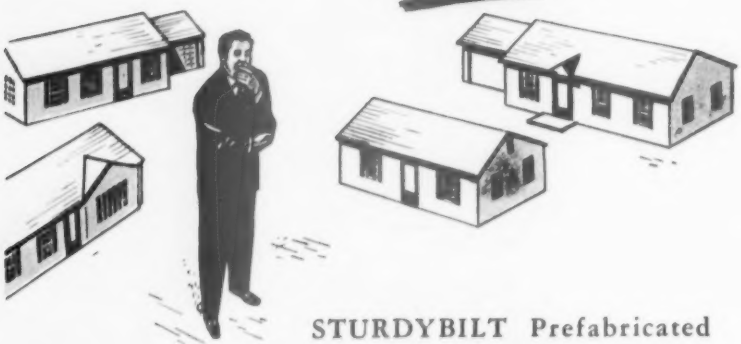
• **Texas Gas Transmission Corp.**—48 miles, 26-in., planned, loops from Memphis to Slaughters, Ky.

• **Texas-Ohio Gas Co.**—1,435 miles, 30-in., proposed, Hidalgo County, Texas, through Arkansas, Mississippi, Tennessee, and Kentucky on to Spencer, W. Va.

• **Transcontinental Gas Pipe Line Corp.**—533 miles, 30-36-in., looping along Texas-New York line.

• **Trans-Northwest Gas, Inc.**—246 miles,

CHOOSE THE FIELD HOUSING DESIGNED FOR *YOU*...



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proposed, International Boundary near Osoyoos, B. C., to Washington and Idaho.

275 miles, branch lines.

• **United Gas Fuel Co., and Central Kentucky Natural Gas Co.**—92 miles proposed, Gulf Interstate system, Boyd County, Ky., to Putnam County, West Virginia.

• **United Fuel Gas Co.**—50 miles, 20-24-in., proposed, Wood County to Lanham, W. Va. Spring 1954.

32 miles, 24-in., proposed, near Ripley, W. Va., to Lanham station, Putnam County, W. Va.

60 miles, 30-in., proposed, Lanham in Kanawha County, West Virginia, to Gulf Interstate line in Boyd County, Ky.

United Gas Pipe Line Co.—44 miles, 20-in., under way, Lirette field to Harvey, La. Brown & Root.

• **United Natural Gas Co.**—50 miles, 12-in., planned, Elk County to Jefferson County, Pennsylvania.

• **Utah Natural Gas Co.**—103 miles, 16-18-in., proposed, Clear Creek field near Price to Salt Lake City, Utah.

18-in., Clear Creek to Provo, Utah.

16-in., Provo to Salt Lake City, Utah.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Warren Petroleum Co.—54 miles, 4-30-in., planned, Lea County, New Mexico.

25 miles, 3 to 20-in., Garvin County, Oklahoma. Completion date 6-54.

Westcoast Transmission Co., Ltd. — (See foreign natural gas pipe lines).

Foreign Crude-Oil Pipe Lines

• **Arabian American Oil Co.**—18 miles, 22-20-in., planned, Qatif to Ras Tanura No. 3. Completion date 1-55.

Bombay Port Trust.—50 miles, 8 to 24-in., contracted, Bombay, India, to serve Standard Vacuum Oil Co., and Burmah Shell refineries. Merritt, Chapman & Scott Corp., contractors. (Crude and Products.)

• **Creole Petroleum Corp.**—25 miles, 34-in., planned. Lagunillas to La Salina (State of Zulia, Venezuela.) Completion date 9-54.

Direccion General de Yacimientos Petroliferos Fiscales—409 miles, under way, Plaza Huincul to Bahia Blanca, Argentina.

• **Gaz de France**—200 miles, 12-in. Ruhr to Paris, France.

• **Petroleos Mexicanos.**—145 miles, 12-in., considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

"Okah, okay, set it aside and we'll look into it after we get this pit dug."

72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

Petroleos Mexicanos.—125 miles, 10-in., under way, Jose Colomo to El Plan, Mexico.

• **Saskatoon Pipe Line, Ltd.**—56 miles, 6-in., planned, Milden to Saskatoon, Sask.

Texas Petroleum Co. — 60 miles, 4-6-in., under way, Pta. Nino to La Dorada.

• **Trans Mountain Oil Pipe Line Co.**—30 miles, planned, Vancouver, B. C., terminal to Ferndale, Wash.

• **Yacimientos Petroliferos Fiscales Bolivianos.**—170 miles, 4-in., planned, Bermejo to Tupiza, Bolivia.

Foreign Products Pipe Lines

Anglo-Iranian Oil Co., Ltd.—18½ miles, 16-in., under way, Little Aden to Aden, Bechtel Corp. Completion date December 1954.

18½ miles, 6-in., under way, Little Aden to Aden. Bechtel Corp. Completion date December 1954.

15 miles, 12-in., under way, Kwinana to Fremantle. M. W. Kellogg Co. Completion date February 1955.

17 miles, 6-in., Kwinana to Fremantle. M. W. Kellog Co. Completion date February 1955.

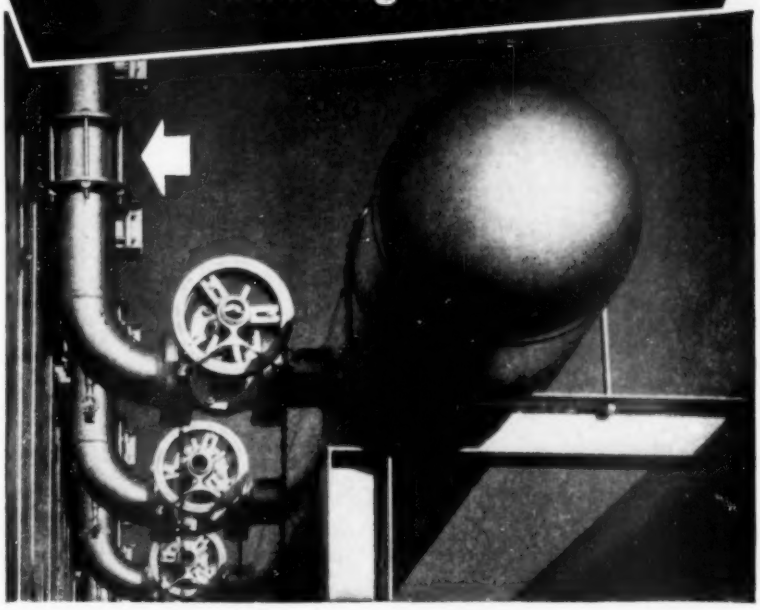
Columbian Ministry of Petroleum—115 miles, 4-in., under way, La Dorado to Cartago, Colombia, Williams Bros. Engineers.

93 miles, 8-in., under way, Cantimplora to Dorado, Colombia, William Bros. Constructors.

• **Empresa Nacional del Petroleo** — 80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

• **Governments of Southern Rhodesia and Portuguese East Africa.**—200 miles, consid-

MIGHTY HANDY...to have around a cooling tower



Around a cooling tower or anywhere else you've got pipe to join, the handiest, surest way to get "Flexible-Tight" joints is with Dresser Couplings or Long Sleeves.

Dressers provide the "give and take" necessary to absorb vibration, settlement and other stresses. Specially compounded rubber gaskets permit up to 4° deflection at joints—yet with Dressers, these joints stay permanently tight.

The only tool you need is a wrench—no pipe threading is necessary. Any workman can install Dressers with ease.

Get Dressers from your nearest supply store.

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COUPLINGS

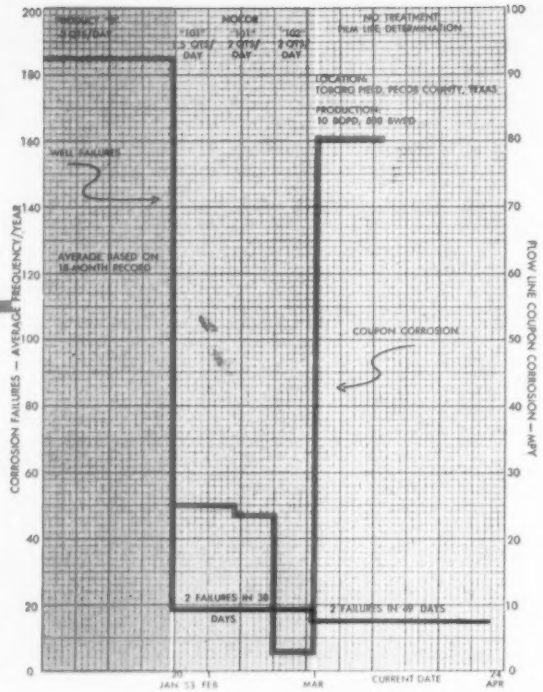
Dresser Manufacturing Division, 49 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston, Texas; 101 S. Bayshore Highway, South San Francisco, California.

TABLE I— A MAJOR COMPANY'S CORROSION COST FOR 41 WELLS IN THE McELROY FIELD, GRAYBURG FORMATION, IN WEST TEXAS, MONTH OF AUGUST 1951. COMPETITIVE INHIBITOR WAS USED.

COST OF INHIBITOR USED	$ 97.54
COST OF UNIT TIME REQUIRED	2,440.41
COST OF EQUIPMENT REPLACED	2,067.35
AVERAGE COST PER WELL	$ 112.32

TABLE II— CORROSION COSTS OVER A 3-MONTH PERIOD IN 1953 ON THE 17 MOST HIGHLY-CORROSIVE OF THE ABOVE 41 WELLS. INHIBITOR USED WAS CARDINAL CHEMICAL'S "NOCOR". AVERAGE COSTS ON NORMALLY CORROSIVE WELLS WOULD BE STILL LOWER.

	MARCH	APRIL	MAY
Cost of Nocor Inhibitor	98.31	88.14	93.00
Cost of unit time required	00.00	00.00	00.00
Cost of equipment replaced	00.00	00.00	00.00
	98.31	88.14	93.00
Average cost per well	5.78	5.18	5.47



Engineering Better Corrosion Controls

CONTROLLED PROGRAM OF COMBATING CORROSION USING NOCOR. AN INHIBITOR DEVELOPED THROUGH EXTENSIVE RESEARCH AND FIELD TESTING.

Many producing formations of the Permian Basin are among the most highly corrosive in the world. The billions invested in this region are often guarded by an infinitesimally thin film of inhibitive chemicals —some good, some better.

It was only natural that Cardinal Chemical, Inc., should locate its corrosion research laboratories at Odessa, center of this prolific oil-producing basin.

Table 1 shows how, in August of 1951, one major company's corrosion costs reached an all-time average high of $112.32 per well. In September of 1951 the company pulled all wells to run bottom hole pressure tests. At the same time, corroded equipment was replaced that appeared in danger of immediate failure. Corrosion cost figures for September are not shown because these figures would reflect costs of some equipment that had not yet actually failed.

A planned program of corrosion inhibition was inaugurated in October of 1951 to excellent effect.

In March of this year, with the use of the Cardinal inhibitor "NOCOR" corrosion costs dropped to an all-time low plus an added saving in per-gallon cost of inhibitor. Average costs in Table 2 are based on the company's 17 most corrosive wells and reflect a higher cost per well than would a field-wide average.

In another instance, as illustrated in the graph, where the operator turned to NOCOR, failures dropped from 279 in a period of 78 weeks to a new low of 4 in 12 weeks. Failures continued to drop even though NOCOR treatment was discontinued. The 49-day check period without treatment illustrates NOCOR's residual protection. The four failures in three months charged against NOCOR were failures of equipment in use during the 18 months prior to March while wells were treated by a competitive inhibitor.

The secret of NOCOR's success lies in its unique characteristics. NOCOR combines chemically with steel itself. The NOCOR molecule adsorbs normal to surface, erecting a close-packed diffusion barrier. NOCOR's long-life film requires little repair, and oil-wetting additives increase its efficiency still further. Structurally non-ionic, it cannot raise pH of brine. NOCOR is non-irritating and non-toxic, contains no constituents such as arsenic which poison catalysts used in refining processes.

These are only two of the countless instances in which NOCOR proved itself and do not indicate its effectiveness only in wells of a particular field or formation. Case histories in fields thousands of miles apart prove NOCOR's superiority wherever corrosion is encountered. For instance, treatment of 150 wells near Great Bend, Kansas, was begun on February 10, 1953, following treatment with a competitive water-dispersible product. Corrosion maintenance costs have decreased to an all-time low following the change-over to NOCOR "102".

Both NOCOR "101" and its successor NOCOR "102" are the results of Cardinal's "unending research to make good products even better." In the laboratory and in the field, Cardinal Chemical is engineering better corrosion control, guarding the billions invested underground in all corners of the world.

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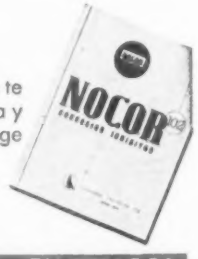

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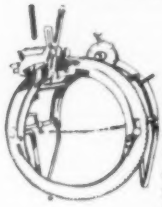

Gives you consistently uniform cuts under toughest field conditions. Unsurpassed in efficiency and economy. Full circle Traveling Ring eliminates jerky movement. Machines accommodating up to 14" pipe are equipped with standard type torch holder. Machines accommodating 16" pipe and larger are equipped with out-of-round attachment.

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ered, Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

North Atlantic Treaty Organization (NATO)—1,920 miles, 4-10-in., to serve military bases in Western Europe (to connect with U. S. Government's St. Nazaire-Paris-Metz line.) Contracted by Soc. Foster Wheeler Francaise.

● **Petroleos Mexicanos.**—124 miles, 6-in., planned, Lagos to Guadalajara, Mexico.

54 miles, 6-in., planned, Lagos to Aguascalientes, Mexico.

82 miles, 8-in., planned, Salamanca to Lagos, Mexico.

● **United States Government.**—375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

● **United States and Canadian Governments**—600 miles, 8-in., planned, Haines to Fairbanks, Alaska.

Foreign Natural-Gas Pipe Lines

Azienda Generale Italiana Petroli — 90 miles, 12-in., under way, Cortemaggiore to Bologna, Italy, SNAM crews.

120 miles, 16-in., under way, Cremona Porto Mar to Ghera, Italy, Montubi, contractor.

40 miles, 12-in., under way, Ripalta-Bergamo, Italy.

Direccion General del Gas del Estado— 310 miles, 8-in., under way, Plaza Huincul to Neuquen, Argentina, to the vicinity of General Conesa, Argentina.

● **Empresa Nacional del Petroleo** — 80 miles, 10-in., planned, Concon to Santiago, Chile.

● **Mid-Continent Pipelines, Ltd.** — 1,860 miles, 30-in., proposed, Alberta to Montreal, Canada. Fish Engineering Co.

● **Northwest Natural Gas Co.**—950 miles, 24-in., planned, Alberta fields to Vancouver, B. C., Seattle, Wash., and Portland, Ore.

Petroleos Mexicanos. — 205 miles, 16-in., under way, Monterrey to Torreon, Mexico.

● **Petroleos Mexicanos.**—440 miles, 20-in., planned, Brazil to Tampico to Poza Rica, Mexico.

● **Trans-Canada Pipe Lines, Ltd. (Canadian Delhi Oil Co.)**—2,247 miles, 14 to 30-in., proposed, Alberta to Toronto to Montreal.

747 miles, 8 to 24-in., gathering system in Alberta.

● **Westcoast Transmission Co., Ltd.**—1,110 miles, 24-in., planned, Dawson Creek, B. C., through Pine Pass and Fraser River Valley to Kamloops, Princeton, and Vancouver to Portland. Ford, Bacon & Davis, engineers.

280 miles, 20-in., planned, Pincher Creek to Montana on to Spokane, Wash. Ford, Bacon & Davis, engineers.

138 miles, 20-in., planned, Sumas to Tacoma, Wash.

139 miles, 18-in., planned, Tacoma, Wash., to Portland, Ore.

● **Western Pipe Lines.**—833 miles, 24-in., proposed, from southern Alberta, eastward across the Canadian prairies, serving principal towns and cities along the route.

Shamrock Laying Products Line in Texas Panhandle

AMARILLO, Tex. — Shamrock Oil & Refining Co. will start construction immediately on a 45-mile, 6-in. products line from the company's 15,000-bbl. refinery at Sunray in Moore County, Texas, to a new terminal north of here.

Vaughan & Taylor Construction, Odessa, Tex., has been awarded contract for the $2,000,000 project. Completion is expected in early 1954.

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DIGEST OF NEW EQUIPMENT

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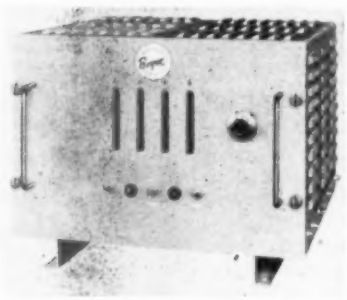
by Dan B. Miller

1 SONIC LIQUID-LEVEL INDICATOR SYSTEM. This new system, which uses no moving parts such as floats, synchros, potentiometers, and switches, has been designed to accurately indicate true liquid levels in petroleum storage tanks within ± 0.01 ft. The equipment is also suited to applications requiring the precise location of the demarcation line existing between immiscible liquids. A direct level reading in tens, units, tenths, and hundredths of a foot is presented on illuminated decimal counters. Level readings are always correct due to the action of an automatic calibration system that compensates for any changes in the velocity of sound propagation which may be caused by varying temperatures, specific gravities, and similar differences between liquids being gaged. This compensatory system is self-contained and does not depend upon external sensing elements of any kind. One common indicator can gage any number of transducer-equipped tanks within a radius of 2,000 ft. By using a remotely operated rotary coaxial-cable tank-switching relay developed especially for this application, a large tank farm may be gaged at a minimum of cost. The indicator can also feed level data to standard digital tape printers for use in automatic inventory and accounting systems. *Bogue Electric Manufacturing Co.*

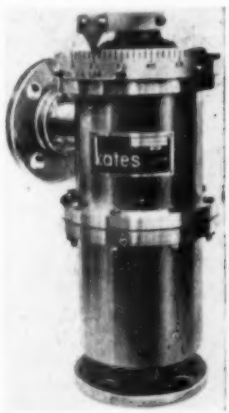


IT'S NEW ✓ CHECK IT

2 NEW LINE OF DIAPHRAGM MOTOR-CONTROL VALVES. The new valves, to be designated Series 800, was designed for use with wide-band, proportional-control instruments. The valve features a redesigned diaphragm motor with pressed-steel case plates. In addition, the valve offers a sturdy yoke with mounting bosses on both sides for auxiliary equipment; a unique locking arrangement for securing the body stem to the spring stem, and either bolted or screwed stuffing boxes. The new line also incorporates direct-acting, reverse-acting, and springless diaphragm motors. These are for operation of either double and single-seated straight-through bodies or for venturi, three-way, and low flow types of bodies. Available with the new line of valves is a line of solid, V-ported, double-seated plugs, plus an additional spring range of 6 to 30 psi. *Minneapolis-Honeywell Regulator Co.*

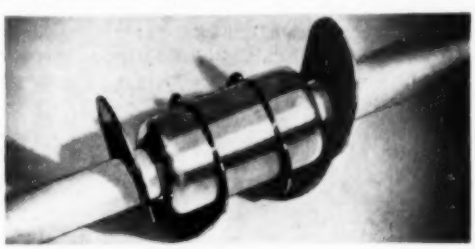
IT'S NEW ✓ CHECK IT

3 KATES TYPE SA REGULATOR will accurately regulate the flow of light slurries, many suspensions, hot tar solution, and other similar materials, despite fluctuations in either inlet or outlet pressure. Down-flow design, specifically engineered to provide self-cleaning characteristics, prevents clogging and blocking by solids, and provides for complete drainage of the regulator with drainage of the piping system. The Type SA uses no air lines, pressure regulators, air filters, seal pots, or other mechanisms. It is a direct-acting regulator and thereby minimizes maintenance while providing fast, positive regulating action at all times. Once the pointer has been set for the desired flow rate, any change in either inlet or back pressure results in an immediate correction of flow rate. Time lag and hunting for the set point are eliminated. *W. A. Kates Co.*



IT'S NEW ✓ CHECK IT

4 NEW MECA COUPLING. This new coupling is designed especially to ease and simplify the process of connecting tubing or pipe in any size range and for any



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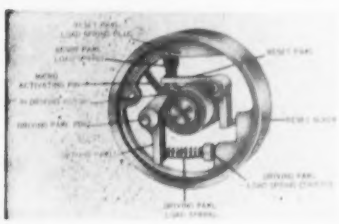
This Digest of New Equipment offers you a quick resume of important features of new or improved products and trade literature and the opportunity to obtain complete information on each subject by use of the convenient "CHECK IT - MAIL IT" service card.

purpose. The coupling requires no threading, flares, ferrules, or tools of any kind to make the connection. In a matter of seconds inexperienced workmen can connect the tubing or pipe into a sealed connection able to withstand extremely high pressures. Press the spring clip, insert the tube, release the spring, and the connection is made. One of the principles of the coupling is the grooving of the interior of the coupling. At each end are grooves containing rubber O-rings, of silicone or tefalon, depending upon use. The sleeve is tapered on the inside to allow for any variation in the outside diameter of the tubing or pipe. The coupling has a stop in the center that allows the insertion of the tubing or pipe to fit equally in each side. The spring clip grips tighter as pull pressure is applied. *The Master Enterprise Corp. of America.*

IT'S NEW CHECK IT

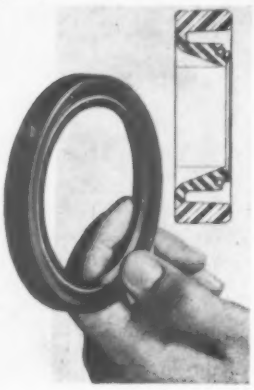
5 NEW TORQUE-LIMITING SAFETY CLUTCH prevents power-drive overloads. It features instantaneous action in torque limitation and is ideally suited for speeds as low as 1 r.p.m. as well as for high speeds. The clutch, which provides permanent protection because of neglible wear of its parts, is easily adaptable to specific driving arrangements such as sprockets, pulley, belts, or gears.



The operation of the clutch is quite simple and positive in disengagement when a predetermined overload occurs and when the clutch is reset for further running of the drive. The operation centers about two pawls, a driving pawl and a reset pawl, which are held in place by separate springs. Compression of these springs is controlled by screw and plug which permit necessary adjustments. When the predetermined overload occurs, the driving pawl slides out of the notch in the driving collar. The reset pawl at this point engages the driving pawl in this released position and the power drive is disengaged. To resume operation, the reset screw is adjusted until the driving pawl is released. The machine will then resume operation at the exact point of release. *Centric Clutch Co.*

IT'S NEW CHECK IT

6 LPD CLIPPER SEAL. The initials LPD stand for line-contact proportionate design. The term "line contact" refers to the lip of the seal which contacts the shaft in a thin line around the shaft circumference. This results in minimum seal wear, low frictional heat, and less drag on the shaft. The narrow lip bearing area also reduces the need for lubrication to a minimum yet the seal receives a greater amount of lubrication in proportion to its surface. The term proportionate design refers to the relationship between the lip area and the hinge area which stay proportionately the same throughout the range of flange widths and shaft sizes. This means that sealing characteristics are constant whether the seal size is small or large. The hinge controls lip contact and its flexibility enables the seal to adapt itself to shaft run-out and minor shaft eccentricities. The husky lip area provides a deep retainer for the garter spring that further assures sealing effectiveness. This spring holds the lip in light but positive contact with the shaft. The deep retaining groove holds it firmly during installation and in operation. The diameter and tension of the spring are carefully predetermined to maintain lip pressure at the minimum necessary to assure proper sealing. The heel is designed for a press fit into the bearing cavity and, since the heel is a composition material, it will conform to irregularities. *Johns-Manville.*

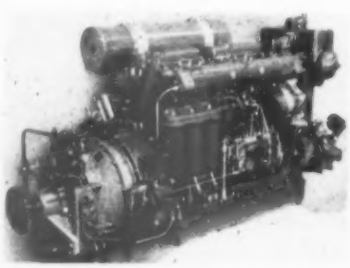


IT'S NEW CHECK IT

7 MARLOW EXTENDS VERTICAL PUMP LINE. With the addition of nine new verticals, the line now includes 23 models with capacities up to 120 g.p.m. The exclusive diffuser design enables the pumps to prime and purge themselves automatically even on suction lifts. A self-lubricating shaft seal eliminates drip, reduces maintenance to a minimum. New models are available in 1½ and 2-in. sizes, with ⅓ to 1½ hp., single or three-phase, open or explosionproof motors. *Marlow Pumps.*

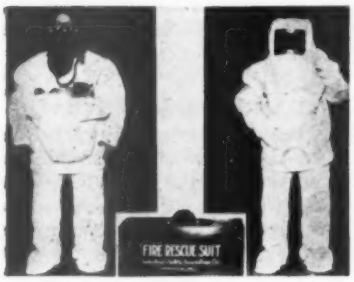
IT'S NEW CHECK IT

8 ROLLS-ROYCE SIX-CYLINDER, SUPERCHARGED, MARINE OIL ENGINE. Bore is 5⅛ in. and stroke is 6 in. Maximum cruising power is 200 b.hp. at 1,800 r.p.m. Maximum intermittent power in fast launches is 250 b.hp. at 2,100 r.p.m. and continuous power rating in heavy craft is 150 b.hp. at 1,500 r.p.m. Fuel consumption at 1,800 r.p.m. maximum cruising speed is 9¾ gal. per hour. Overhead valves are push-rod operated. The single-lever remote hydraulic control system with throttle interlock insures complete engagement of ahead and astern gear before engine speeding occurs. Engine also includes emergency manual control of ahead and astern gears and throttle. Fuel-injection equipment includes jerk-type injection pump with all-speed hydraulic governor set to limit engine speed under load conditions; fuel lift pump; multihole injectors; and triple fuel filters, mounted externally, with expendable elements. *Rolls-Royce, Ltd.*



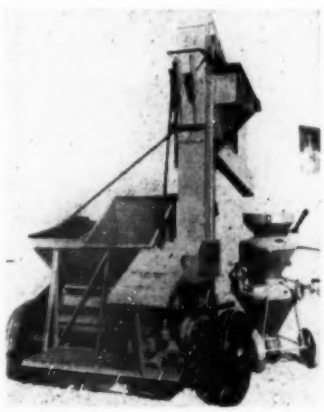
IT'S NEW CHECK IT

9 ISSCO FIRE RESCUE SUIT which will withstand temperatures up to 1,800° F., has been tested exhaustively on fire training grounds, in laboratories, and industrial plants. It has demonstrated its effectiveness against pit and spill fires under all conceivable conditions. Wherever fire is a hazard, this suit is recommended to save lives and property and to reach and extinguish the heart of a blaze quickly. Complete, the suit weighs 28 lb. and with rescue blanket, 6 lb. additional. Basic construction is an outer layer of 90 per cent asbestos cloth, plus 1 in. of glass fiber insulation covered with aluminum foil, plus an inner lining of vinyl-treated glass cloth which acts as a steam barrier. Trousers are one-piece and completely cover feet, legs, and lower abdomen up to a point 8 in. below the arm pits. Legs are wool lined for additional protection, and shoe sections are double thickness throughout. The hooded blouse is designed to be roomy but not bulky and extends well below the waistline. Hood section contains a large, laminated safety-glass window, permitting a wide field of vision. In addition, the hood leaves ample room for the wearing of self-generating breathing apparatus. *Industrial Safety Specialties Co., Inc.*



IT'S NEW CHECK IT

10 THE MIX-ELVATOR. This machine is a portable, self-contained unit that is ready to operate when located at the material stockpile. An outstanding feature of the new Mix-Elvator is the readily adjustable ratio control that permits an accurate mixing range from 1:3 to 1:8. To insure continuous operation under all conditions for all types of concrete gunning equipment, the Mix-Elvator engine speed can be adjusted to give a mixing and elevating capacity from 2½ to 8 cu. yd. per hour. The operator can recharge the machine as needed by means of the gate valve in the overhead chute. A complete screening arrangement and a single clutch control permit material or aggregate to be handled only once during the complete operation and allow one laborer to handle the entire operation alone when the stockpile is conveniently located. *Air Placement Equipment Co.*

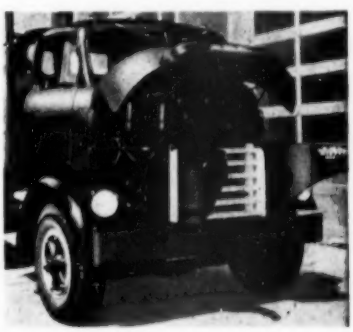


IT'S NEW CHECK IT

11 IMPROVED DRILL-PIPE WIPER. The knuckle-joint action built into the center of the new drill-pipe wiper provides a stress-relieved pliability where it is needed most, around the wiping lips. The result is a give-and-take bending action that is essential to adequate wiping. The outer edge of rim of the wiper has all the required rigidity, being hard rubber of 90 Durometer as compared to 45 hardness in the center. Another feature of the wiper is its bowl shape. This construction makes it a perfect junk catcher for tong dies and other small objects. This wiper is a one-piece high-pressure mold job of natural rubber constructed without any metal to cause sparks. Tool joints will pass without rupturing the lips, while a tendency to up-end when slammed against the inside of the rotary table lessens shock in the vital lip area. Ports that can be easily cut, are molded into the bowl-shaped bottom, to allow mud recovery back into the hole. An Ease-On plug of molded hard rubber, which fits into the top of the tool joints, and permits installation of the wiper without lip damage, is provided at no charge. *Weatherford Oil Tool Co., Inc.*

IT'S NEW CHECK IT

12 NEW SERIES OF SHORTENED G.M.C. CAB-OVER-ENGINE HIGHWAY TRACTORS gives operators maximum load opportunities. Bumper-to-back-of-cab length on the new heavy-duty COEs now in only 72 in., a reduction of 10 in. on present models. This design was achieved by using a flush radiator grille and squaring off the back of the cab. Heavy-duty G.M.C.s thus affected are Models F630-42, DF660-47, and F660-50, all being four wheelers, and the following six-wheelers which are new models in the G.M.C. line; FW620-42 and DFW620-47. Another feature of the 72-in. G.M.C. design is the bumper-to-front-axle dimension of 28 in. G.M.C. truck also has shortened the COE models in the 2 through 4½-ton range by moving the front bumper back about 5 in. To minimize service problems on the heavy-duty COEs, hinged doors have been placed on either side of the grille and engine accessory locations have been changed to facilitate quicker servicing. *G.M.C. Truck & Coach Division, General Motors Corp.*



IT'S NEW CHECK IT

TRADE LITERATURE

13 TEMPERATURE CONTROL SYSTEMS. Educational Bulletin F 6149 will help in the selection of sensing elements and their correct use for the most satisfactory results. Instrument industry control terminology is given in this bulletin, as well as rules to follow in selecting the proper method of temperature control for process characteristics or reaction. A complete explanation is contained of the various types of control systems, ranging from two-position on-off to proportional position with automatic reset. *Wheelco Instruments Division, Barber-Colman Co.*

14 NATIONAL IDEAL KELLYS in full A.P.I. range of sizes are presented in a new four-page bulletin, No. 413. Complete specifications are tabulated. *The National Supply Co.*

15 G-E TIME SWITCH CATALOG. The new 24-page bulletin, designated GEA-5965, contains selection and application information as well as descriptions of the various types and models available. Features, specifications, operating data and pricing information are included in the illustrated publication. *General Electric Co.*

16 DESIGN AND CONSTRUCTION IN STEEL PLATE. The brochure is designed to survey the extent of Whessoe activities in the oil, gas, chemical, and other industries. It takes the form of a brief survey of the Whessoe organization with a pictorial representation of the Whessoe shops layout at Darlington. In the brochure are illustrated and described the various forms of Whessoe manufacture, ranging from storage tanks of every size, including vapor-conservation applications, to tank fittings manufactured under license from Shand & Jurs Co. It covers heat exchangers, refinery plant, pressure vessels, and various forms of processes and storage methods. *Whessoe, Ltd.*

17 HANDBOOK OF DATA FOR PROPER SELECTION OF CRANE-EXCAVATORS. The pocket-size booklet contains specific information on major design and construction fundamentals which are presented in a concise, matter-of-fact style. Actual comparison charts are included for added reading convenience. This handbook has been prepared to help make certain that the selection of a crane-excavator is the one best suited for a particular job whatever the requirement. *Wayne Crane Division, American Steel Dredge Co., Inc.*

18 E TYPE GUARDIAN SAFETY FUEL OIL HEATER, described in Bulletin 742, provides positive protection against oil contamination of boiler water in below-the-water-line heater installations. This is the fuel-oil preheater with the M & L Guard-a-Probe electric element that detects oil in boiler water and the M & L Guard-a-Trol control box that sounds an alarm in case of accidental leakage of fuel oil in the preheater. Intended for below waterline service, the heater is always made with admiralty or copper-nickel tubing for maximum corrosion resistance. *Manning & Lewis Engineering Co.*

19 HCB SINGLE STAGE TURBINE is a six-page bulletin containing design features, dimensions, and performance data on the new De Laval HCB single-stage turbine. The single-stage turbine was designed for a variety of plant applications and can be ordered from stock for immediate delivery. Maximum operating conditions are: Horsepower to 100, pressures to 300 psig., temperature to 550° F., speed to 4,000 r.p.m. The bulletin presents a two-page cutaway diagram of the HCB turbine with a descriptive list of 18 design features. *De Laval Steam Turbine Co.*

20 DESIGN AND OPERATING OF CONTROLLED VOLUME PUMPS. The second in a series, this paper deals with the design and operation of controlled-volume chemical feed pumps from basic units to specialized models. Complete systems are illustrated to show the application of these pumps in pH control, automatic titration, and proportional feeding. Some new designs and recent developments are discussed including the Constametric. This model is a reciprocating plunger, positive-displacement type pump which produces a straight line, pulsation-free flow. *Milton Roy Co.*

21 P. & B. EVAPORATOR-DISTILLERS, a 16-page brochure, covers equipment for the distillation of water for boiler feed and other industrial requirements. In addition to describing the thermocompressor which accomplishes an increased output per pound of steam, sectional flow diagrams illustrate the operation of the vapor recompression method of evaporation, the thermal circulation evaporator, and the triple effect of the P. & B. Evaporator. *Aiton & Co., Ltd.*

22 UNITIZED VACUUM TANK. A truck-mounted tank and accessory equipment designed to load, carry, discharge, and agitate industrial liquids and semisolids with different viscosities, such as rotary mud, oil, water, brine, or chemicals, are described in this brochure. The unitized equipment is designed to maintain either a partial vacuum or pressure within the tank. Each tank is individually manufactured to meet the purchaser's specifications. *Thompson Tank & Manufacturing Co., Inc.*

23 DANGER AND PREVENTION discusses the application and action of Tixton, an activated bentonite, as a starting material for drilling muds in deep wells, as a basis for mud, to prevent caving, to prevent mud loss, and as the basic material for weighted muds. *Sud-Chemie Aktiengesellschaft.*

24 VERTICAL TURBINE PUMPS for the safe and efficient handling of all petroleum products and other volatile fluids are described in a new Bulletin 101. Capacities of these pumps range from 40 to 4,000 g.p.m., and more for special service requirements. They are manufactured in two types. The standard pump has suction below grade and discharge above grade for pumping volatile fluids from underground storage tanks. The Line-Flo pump, with both suction and discharge above grade, is for direct fuel transfer using minimum installation space. *Layne & Bowler, Inc.*

25 ELLIPTICAL VENTURI TUBE. A new five-page brochure describes the Type VE venturi tube. This unit is a primary device used to produce pressure differentials from flowing liquids for the purpose of actuating rate of flow meters. The tube has a circular inlet and outlet, but is constructed with an elliptical throat design. Data are given as to how any low-velocity, low-pressure flow of liquids, containing solids, can be measured in connection with a venturi meter. The tube is available for pipe lines measuring 12 to 84 in. in diameter with larger sizes to specification. Operation is standard at 125 or 250 psi. *Simplex Valve & Meter Co.*

26 NEW POWERACTOR POSITIONER. Bulletin 473 describes a new force-balance-type positioner for cylinder-operated devices. Designed especially for use with the Foxboro Stabiload cylinder, the Poweractor unit will position equipment requiring high power and long stroke, such as large-size control valves, large dampers, and variable-speed drives, through pneumatic cylinder (or springless diaphragm) operating mechanisms. *The Foxboro Co.*

PIPE LINE

Changes Approved

Firms revise $100 million Southwest gas-line project

WASHINGTON.—The Federal Power Commission has authorized certain changes in the $100,000,000 pipe-line project, which is designed to transport 300,000,000 cu. ft. of gas daily from the Southwest to midwestern markets, being carried out by El Paso Natural Gas Co., Northern Natural Gas Co., and Permian Basin Pipe Line Co.

The changes were set forth in two orders. One order permits Permian to construct 67 miles of 20-in. line in lieu of 70 miles of 16-in. line in Texas as previously authorized. The line will run from the Mitchell gas field in Pecos County to the company's Plymouth compressor station in Upton County.

The company pointed out that the larger line will have a capacity of 187,000,000 cu. ft. daily as compared to 100,000,000 cu. ft. per day for the smaller line. Also, the latter would require a compressor station whereas the newly authorized line will not.

Other changes . . . The other order set forth changes in the previously-approved plans by which Permian is to deliver gas to Northern Natural through El Paso's lines. Under the old plans, Permian was to deliver the gas from West Texas and New Mexico fields to El Paso's system at Wasson, Tex. Then El Paso would transmit an equivalent amount of gas to Northern Natural at Dumas, Tex. The new plan calls for Permian to deliver the gas to Northern Natural at Wasson where the latter firm will turn the gas over to the El Paso. From that point to Dumas El Paso will deliver the gas for Northern Natural's account instead of Permian's. Consequently, Permian will not have to build a measuring station at Dumas *(The Oil and Gas Journal, October 12, page 185)*.

Another petition . . . At the same time that the above changes were requested, El Paso submitted a separate application seeking revision of its authorized expansion plans. The company wants Permian to deliver up to 225,000,000 cu. ft. of gas to El Paso's proposed Plains, Tex., compressor station in order to prevent the two firms from laying duplicate lines. In addition, El Paso is seeking to have some of the pipeline facilities in the Spraberry area changed to provide greater flexibility of operation. The company estimates that the new proposal will save about $5,884,910 in pipe-line construction costs.

Pipe-line construction by Permian and El Paso is expected to be completed within 3 weeks. A transmission system between Dumas and Omaha, which will enable Northern Natural to distribute the gas in the Central and Midwest states, will be finished and in operation late next year *(The Oil and Gas Journal, May 11, page 163)*.

Dallas Oil Operator Proposes Texas-California Crude Line

WASHINGTON. — A proposal to construct a crude-oil line from West Texas to the West Coast was aired recently at a Senate Interior subcommittee hearing here by L. M. Glasco, Dallas operator.

Glasco, president of West Coast Pipe Line Co., told the subcommittee, which is investigating U. S. petroleum reserves for defense purposes, that he had been working on the $106,000,000 project for 10 years. He pointed out that the weakest link in the country's defense network is the absence of a crude line to the West Coast.

In backing up his argument for the proposed line, he stated that the United States cannot depend upon oil-short Canada to supplement petroleum supplies. "The Canadian civilian economy requires approximately 500,000 bbl. per day, and the total Canadian production of crude oil remains at around 260,000 bbl.," he asserted.

A.P.I. Asks Texas Group to Change Oil-Line Tables

AUSTIN. — The Texas Railroad Commission has been asked to adopt the new measurement standards for oil pipe lines set up by the American Society for Testing Materials.

The request was made by the American Petroleum Institute's Committee on Pipe Lines. The group's application pointed out that the new standards, which will become effective January 1, 1954, have been adopted generally throughout the oil industry and by the federal Government. Texas presently operates on the temperatures and gravity tables set up by the United States Bureau of Standards in 1937.

The Bureau of Standards has advised

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the commission that the new measurements will not vary more than one-tenth of a gallon for each thousand gallons of petroleum put through a line. However, Superior Oil Co., the only firm to raise an objection to the proposal, has requested a 30-day delay in order to study the effect of the proposed standards change.

Plains May Sell Crude Line

NEWCASTLE, Wyo.—Plains Pipe Line Co. here is considering selling its 6 and 8-in. crude system in eastern Wyoming.

The Plains system serves Weston County, Wyoming, producers with crude transportation from Mush Creek to Newcastle and Lance Creek. Recently the line's capacity was raised to 24,000 bbl. per day, but at the same time the per-well take in Weston County fields dropped to 65 bbl. daily.

FPC Approves Short Gas Line

WASHINGTON.—Southern Natural Gas Co., Birmingham, has been authorized by the Federal Power Commission to construct a 2-mile, 12¾-in. gas line near Macon, Ga.

The line will extend from the existing branch line at Bass Junction southeast to Atlanta Gas Light Co.'s Plant Arkwright tap line, which is being purchased by Southern Natural. The project will cost about $66,800.

The purchase of the 1¼-mile, 10¾-Plant Arkwright tap line was approved recently by the FPC. The FPC also authorized Southern Natural to sell its Macon tap line, consisting of about 1,452 ft. of 10¾-in. pipe, and a measuring station located near the line to Atlanta for $9,429.

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Among the Drilling Contractors

Falcon Seaboard Plans Expansion of Operations

Falcon Seaboard Drilling Co., Tulsa and Houston, is preparing for a substantial expansion of its operations following the sale of approximately $1,000,000 worth of newly issued stock to Fox Wells & Co., private investment firm of New York.

The expansion program will involve not only further development of company-owned production properties, but also general drilling business of the company. It will entail the addition of new personnel to enlarge the company's present organization of more than 300 persons.

With the stock sale, one of the largest pieces of financing by any drilling company this year, Heywood Fox, member of the investing firm, and Roger H. Weed, that firm's attorney, are being added to Falcon Seaboard's board of directors.

The present board consists of T. N. Law, Tulsa, president of the company; C. W. Alcorn, Houston, executive vice president, Gulf Coast division; and J. L. Strauss, Tulsa, executive vice president, Mid-Continent division, and treasurer of the company.

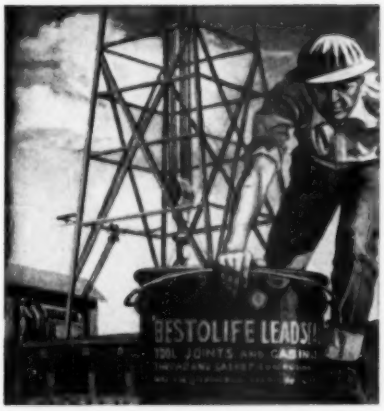
No change in management or policies of the company is contemplated with the added directors or other new personnel to be provided.

Falcon Seaboard, one of the foremost and active drilling companies in the Mid-Continent and Gulf Coast areas, currently is operating 22 drilling rigs in these and the Rocky Mountain areas. In addition to its extensive contracting business, it also is active in developing properties of its own, and has oil production totaling approximately 1,000 bbl. daily. It maintains offices in Oklahoma City, Denver, and Lafayette, La., in addition to Tulsa and Houston.

The company had its beginning in 1935. It was started by Law, its present president, who is a grandson of the late T. N. Barnsdall, founder of the former Barnsdall Oil Co., now merged with Sunray Oil Corp.

Bankhead Drilling Co., Baton Rouge, La., has contracted with James N. Snowden and associates, of Fort Worth, for a deep test to be drilled 3 miles southeast of Baton Rouge, in East Baton Rouge Parish, Louisiana. The new test, 1 Kleinpeter, in 77-8s-1e, is the first confirmation test for Baton Rouge field, opened last May by Atlantic Refining Co. The discovery, and

$1,000,000 STOCK SALE . . . T. N. Law, president of Falcon Seaboard Drilling Co., Tulsa, accepts check sealing the deal for sale of $1,000,000 worth of newly issued Falcon Seaboard stock to Fox Wells & Co., New York investment firm. Seated, left of right: Heyward Fox, member of investing firm, handing check to Law; Law; and Roger H. Weed, New York, counsel for investing firm, looking on. Standing, left to right: Joe Holliman, Falcon Seaboard counsel, and member of the Tulsa law firm of Carlson, Lupardus, Matthews and Holliman; J. W. Stauss, Tulsa, and C. W. Alcorn, Houston, executive vice presidents of the drilling company; and John Winters, counsel for the investing firm, and member of the Tulsa law firm of Conner, Winters, Randolph and Ballaine.



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so far only well in the field, produces from Frio sand at 10,054-60 ft. The new operation is scheduled as an 11,000-ft. test.

Rocky Mountain Drilling Co., Los Angeles, has a contract with Tide Water Associated Oil Co. for a deep exploratory test to be drilled in the Shafter area about 2½ miles northwest of Rio Bravo field, 15 miles northwest of Bakersfield, Kern County, California. The test, 54-18 Shafter Prospect, in 18-28-25, is projected to 13,000 ft.

Barnes & Shadrick Co., Bakersfield, Calif., has a rig on a wildcat test being drilled for Continental Oil Co. in the Tulare Lake area, 18 miles east of Avenal, in Kings County, California. Location is for 1 West Lake unit, in 32-22-20.

Tandem Drilling Co., Camden, Ark., is drilling for Murray Petroleum Co. at 1 May, a projected 5,300-ft. Rodessa test, located in 28-16s-26w, northeast of Fouke field, in Miller County, southwestern Arkansas.

Warren & Hollyfield, Smackover, Ark., will drill a 2,500-ft. Smackover test for A. B. Turner and associates at a wildcat location southeast of Sayre, in northwestern Ouachita County, southern Arkansas. Location is for 1 Green, in 28-11s-9w.

New Two-Year Record Set In Number of Active Rigs

More rotary rigs were reported running the past week than at any time since December 1951, when an all-time record was set in drilling activity.

ACTIVE ROTARY RIGS*

Area—	Week ended 12-7-53	Change week ended 11-30-53	Change week ended 12-8-52
Gulf Coast	600	+ 8	— 42
N. & W. Tex.-N. M.	880	+ 7	+ 32
Ark.-N. La.-E. Tex.	214	+13	+ 72
Oklahoma	385	+ 2	+ 30
Kansas-S. Nebraska	165	+11	— 12
Illinois-Eastern	165	+25	+ 17
Rocky Mountains	290	— 5	+ 67
Pacific Coast	187	+12	+ 12
Total U. S	2,886	+73	+176
Western Canada	158	+ 1	— 17
Total	3,044	+74	+159

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States, North and West Texas and New Mexico, and Oklahoma and Kansas are shown on pages 215 and 216.

Active rigs during the week totaled 3,044, 66 more than this year's previous high number of 2,978 rigs running two weeks before, and 12 more than the 1952 peak number of 3,032 rigs reported operating last December.

At the time the all-time record was set, in mid-December 1951, there were 3,181 rigs running, 137 more than the present number. The number continued above the 3,100 mark for the remainder of that month but dropped below 3,000 at the opening of 1952, and has been below that level most of the time since then.

New peaks in drilling activity for the year were set during the week in the West Texas-New Mexico, Arkansas-North Louisiana-East Texas, and Pacific Coast areas.

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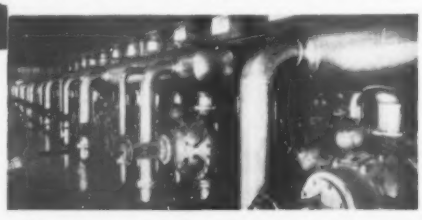
Fluor Pulsation Dampening Piping System built into new compressor station assures accurate metering.



Fluor Pulsation Dampeners curb vibration caused by reciprocating action of compressors.

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REFINING

Sinclair Cuts Crude Runs

NEW YORK.—P. C. Spencer, president of Sinclair Refining Co., announced last week that the company reduced crude runs by 15,000 bbl. per day effective December 7.

The reduction which represents about 4 per cent of previous operating rates will enable Sinclair to keep its finished product inventories in line with the low 1951-1952 levels. Prudent restraint by the industry is required in view of present high stocks resulting from unseasonably warm weather and excessive crude runs, said Spencer. He added that a prolonged deterioration in the situation threatens not only product markets but might also affect the crude structure.

Expansion Project Completed

BUFFALO.—Frontier Oil Refining Co., a subsidiary of Ashland Oil & Refining Co. has completed an expansion program which has raised the capacity of its Tonawanda, N. Y., refinery to 30,000 bbl. per day.

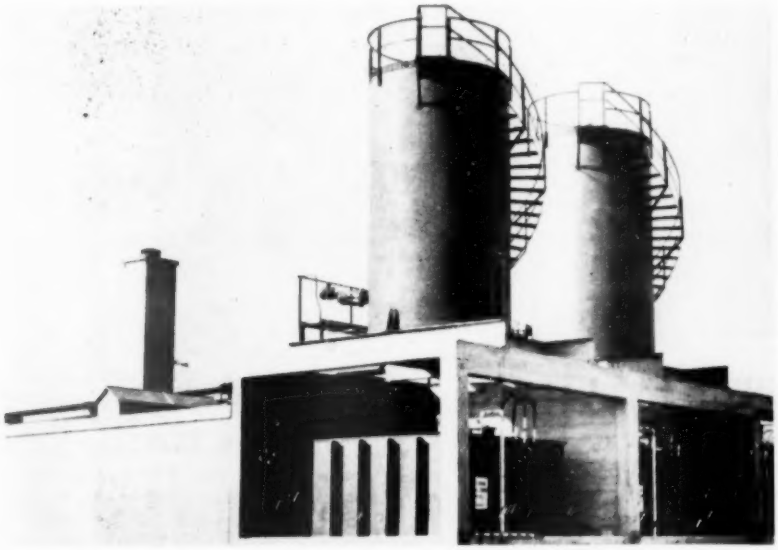
The program included a new 12,000-bbl. per day fluid catalytic cracking unit designed and licensed by Universal Oil Products Co. New crude capacity includes a 10,000-bbl. per day vacuum stage. Thermal cracking was increased by a 1,800-bbl. per day visbreaker, and catalytic polymerization capacity was expanded from 125 to 825 bbl. per day.

Training Group Expanding

NEW YORK.—Establishment of a number of area subcommittees is in prospect for the American Petroleum Institute Division of Refining's committee on training.

One such group numbering 31 members is now active on the Gulf Coast. Two are planned for the Pacific Coast at Los Angeles and San Francisco and additional ones may be organized for the Chicago, New York, and Mid-Continent areas. The latter will probably embrace northern Oklahoma, St. Louis, and Kansas originally, and may later be divided into two separate geographical groups.

According to D. S. Turner, Standard Oil Co. (Ohio), who is chairman of the committee on training, the Refining Division's training library is in full operation at New York. A complete list of all training material, including manuals and films, will be is-



Shell Opens New Alcohol Denaturing Plant

This new alcohol denaturing plant at Argo, Ill., near Chicago aids Shell Chemical Corp. in providing faster service to its midwestern customers. The plant is equipped to furnish the most generally used grades of denatured alcohol and proprietary solvents in this area. Alcohol for denaturing is shipped by barge from Shell's Houston plant (Shell Chemical Corp. photo).

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Refining Briefs

NEW YORK. — California Oil Co., marketing subsidiary of Standard Oil Co. of California, last week introduced the company's new RPM 10-30 motor oil in Eastern markets. The oil meets the viscosity classifications of SAE 10-W, 20, 20-W and 30 grades. It also meets the requirements for Service MS and Service DS conditions in gasoline and diesel engines.

DES PLAINES, Ill.—Universal Oil Products Co. has started building a new catalyst manufacturing plant at McCook, Ill. The new facility, the fourth for manufacturing the company's Platforming catalyst, is expected to be in operation next summer.

WHITING, Ind. — Standard Oil Co. (Ind.) is nearing completion of a building site for its new 30,000-bbl. Hydroforming unit here. Actual construction of the unit is expected to get under way early next year by M. W. Kellogg Co., with completion set for late 1954.

Petrochemicals

Fluor Gets Engineering Contract for New Plant

NEW YORK. — Fluor Corp. has been picked as engineer contractor for Shell Chemical Corp.'s new Norco, La., plant, according to Cecil W. Humphreys, Shell Chemical's manufacturing vice president.

Allyl chloride and chlorohydrin, to be produced at Norco, will boost the company's glycerin production by 25,000,000 lb. per year and will add to the production of epichlorohydrin and Epon resins. Fluor will start work immediately on the engineering, and the plant is scheduled for completion late in 1954.

R. K. Walters, recently named a senior engineer in Shell Chemical's head office, New York, will be construction superintendent for the Norco project. He will be assisted by E. P. Franzen, project engineer, process and K. O. McDonald, project engineer, off-site. W. A. Gabig will assist Franzen and E. A. Lawver will be McDonald's assistant. Assistant construction superintendent is C. C. Brothers.

NATURAL GAS

New Mexico May Prorate San Juan Gas Production

SANTA FE.—The New Mexico Oil Conservation Commission here has informed operators in the San Juan basin that it will begin prorating natural gas unless substantial evidence is produced at an April hearing showing why such measures should not be taken.

In an investigation of gas production in the basin, the commission has ordered four natural-gas companies producing from the Blanco-Mesaverde formation to submit monthly production figures for 1953. In addition, these firms were told to produce copies of all agreements negotiated with purchasing companies.

The order was issued to Stanolind Oil & Gas Co., Southern Union Gas Co., Southern Union Gathering Co., and El Paso Natural Gas Co.

San Juan Gas to Pacific Northwest Gets Support

SANTA FE. — Pacific Northwest Pipe Line Co.'s proposal to transport natural gas from New Mexico's San Juan basin to the Pacific Northwest has received support from Richard C. Spurrier, director of the state oil conservation commission.

Spurrier said that transmission companies will need about 7 trillion cubic feet of gas from the basin during the next 20 years. However, he pointed out that proved reserves in the area total approximately 11 trillion cubic feet. He added that if the gas were taken "it would mean additional development for northwestern New Mexico and additional revenue for the state."

Pacific Northwest's project, which is now before the Federal Power Commission, is opposed by Westcoast Transmission Co., Ltd., which proposes to supply the region with gas from Alberta fields.

A.G.A. Completes Study on Substitute for Natural Gas

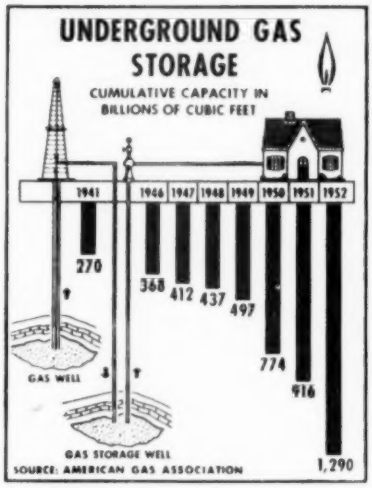
NEW YORK.—A study on an available supplement for natural gas in case the supply of the latter resource diminishes has been completed by the Gas Production Research Committee of the American Gas Association.

The study evolved around the most advanced methods of making Btu gas from coal. The committee's report stated that this gas is the most logical substitute for natural gas because of its high heating value and the large reserves of coal in the United States.

It was pointed out that Btu gas will cost substantially more than natural gas but would be justified economically in some areas if natural-gas supplies diminish. In addition, the group felt that, even though there is currently a large natural-gas reserve in this country, that it is very possible for this reserve to disappear in future years.

The report concluded that the development of an ideal gasification process may take 10 years from concept. This would involve extensive research, design and construction of commercial facilities, and reorganization of the integrated coal and gas industries.

The report may be obtained from the American Gas Association for $4 per copy.



Storage Capacity Soaring

This chart released by the American Gas Association shows that natural-gas underground-storage capacity has been increased over five times since 1941. This winter approximately 13 million homes in the United States will be heated by gas now in storage.

Third-Quarter Sales Up 9.4 Per Cent This Year

NEW YORK.—Natural-gas sales in the third quarter of this year totaled 10,502 million therms, an increase of 9.4 per cent over the 9,600 million therms sold during the same period in 1952, according the American Gas Association here.

For the 12 months ended September 30, 1953, sales amounted to 52,950 million therms, a gain of 11.7 per cent over sales of 47,420 million therms last year. During the same 12-month period this year, a total of 19.8 million customers were served by natural gas representing 75.5 per cent of all gas-industry customers. The previous 12 months there were 18.7 million natural-gas customers.

Revenues from sales to ultimate consumers during the third quarter of 1953 reached $372 million, an increase of 17.8 over the $316 million recorded last year. For the year up to September 30, these sales totaled $2,209 million, a jump of 18.8 per cent over the $1,859 million in revenues reported for the like period last year.

Natural Gasoline

Gulf to Build $10 Million Cycling Plant in Louisiana

HOUSTON.—Construction will start within 2 weeks on a $10,000,000 cycling plant in St. Landry Parish, Louisiana.

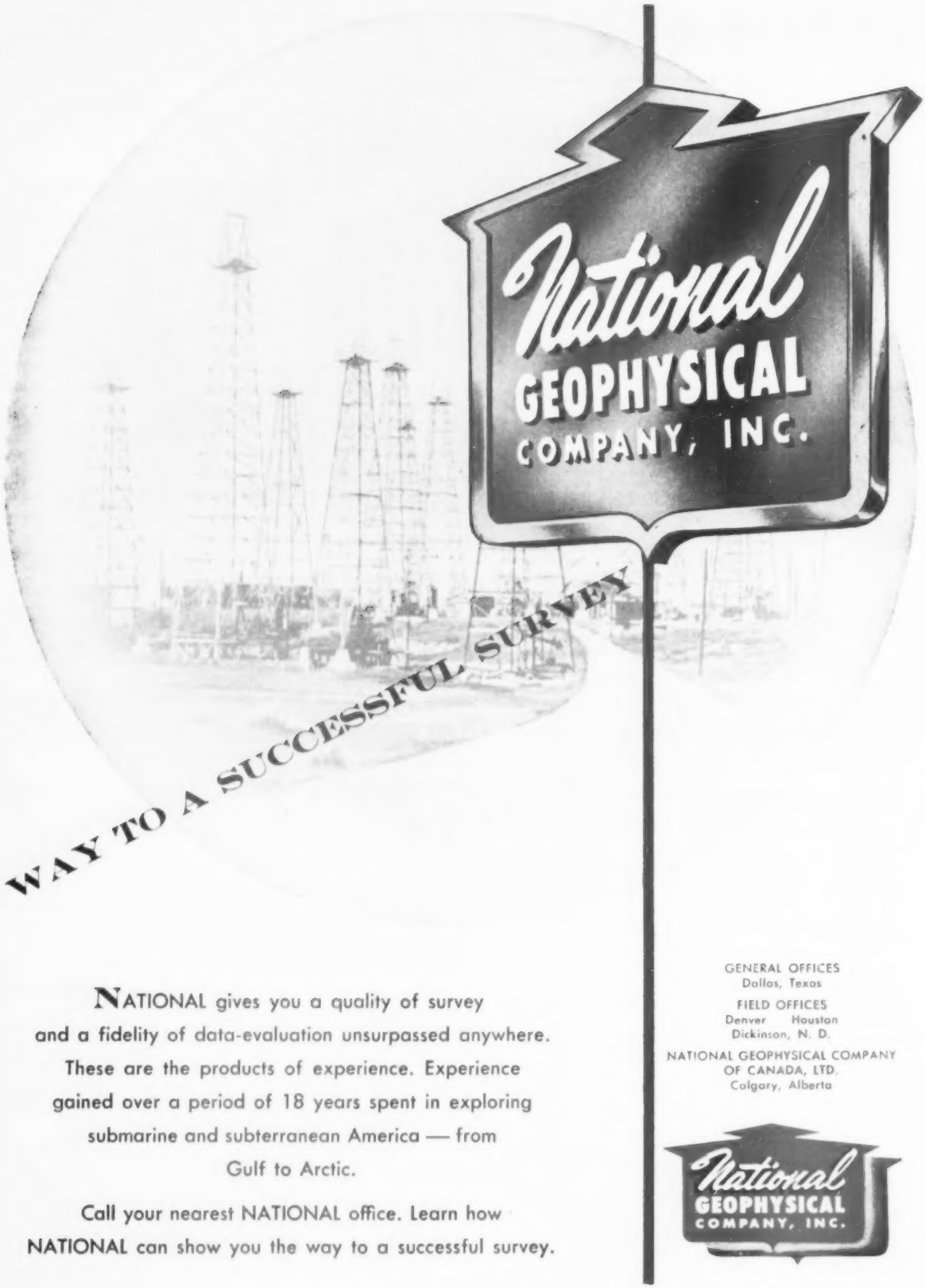
The proposed plant will process gas from the newly-unitized Krotz Springs gas-condensate field in the parish. Gulf Refining Co. will build and operate the new facilities, which will be owned jointly by Gulf, Humble Oil & Refining Co., and The Texas Co.

The new facilities are expected to recover an additional 27.5 million barrels of condensate, butane, and propane from the field. It is planned to be completed and in operation by mid-1955.

Additional Compressors Being Installed at Elk City Plant

ELK CITY, Okla.—Six new 1,760-hp. compressors are being installed at the natural-gas processing plant here which is being expanded by 14 operators in this area.

After the compressors are in place, work will start on a 62-ft. absorption column and a 100-ft. fractionating column. When the expansion project is completed by Fluor Corp., Ltd., the plant's intake capacity will reach 225,000,000 cu. ft. of gas daily, and its output of natural gasoline, butane, and propane will be increased 50 per cent *(The Oil and Gas Journal, September 14, page 173)*.



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EXPLORATION

Whittier Fault Pools Stage Revival

by D. H. Stormont

RECENT discoveries and extensions to fields south of the Whittier fault, which extends from the eastern outskirts of Los Angeles to the southeast about 30 miles, is giving new life to an area which has been productive for 75 years.

At the first of 1950 there were only eight producers in the 4-mile interval between Whittier and Brea - Olinda fields. These were on Union Oil Co.'s fee-owned Sansinena property in SE 30-2s-10w. Continued exploration eastward indicates production will be continuous between Sansinena and Brea-Olinda. Likewise, but yet to be proved by the drill, a band of production likely will extend through 25-2s-11w to join with Whittier field (see map).

At Puente, scene of first commercial oil production in Los Angeles basin, and in the Brea Canyon area, Shell Oil Co. and other operators have been engaged in developing deeper pays. As a result, the field's output has increased from about 12,500 bbl. to 24,000 bbl. daily. Shell activity accounted for about 9,000 bbl. of the gain.

Most recent discoveries along this trend of fields have been at Whittier (Well A), East Sansinena (Island 8), and east of the Olinda area (Well E). Three wildcats, Wells B, C, and D, currently are under way as well as confirmation tests to the Whittier and East Sansinena discoveries.

Union has only one rig at work, at Island 8, but shortly after the first of the year will start development from Islands 7 and 11. Other planned activity, as well as past drilling which has brought its Sansinena production to 8,100 bbl. daily, is shown on the map. Shell currently has eight rigs on development and exploratory work in the Puente and Brea Canyon areas.

The Whittier deeper-pool discovery was Standard Oil Co. of California 77 Central Fee, completed flowing 221 bbl. of crude through perforations at 4,655-5,055 ft. Production is from upper Miocene sands; surrounding wells are producing from the Pliocene. Some idea of the new pay's extent will be gained from Standard's northwest offset and from O. M. Slosson 1 Strong (Well B) under way ½ mile west.

After having established production on its Naranjal property in SE SE 33-2s-10w, Union in March completed 1 Lindauer in NE SE 32, and then in September completed 8-B-1 Sansinena in NE NE 33. The latter flowed 443 bbl. daily from 5,077-5,315 ft. to rate as one of the best wells in Sansinena. A total of 15 wells are planned from the drilling island.

In the Carbon Canyon area east of Olinda, 1 Del Giorgio Unit is being tested in an upper Miocene sand at about 4,600 ft.

The Whittier fault, a high-angle reverse fault which has the north side thrust over the south with 5,000 to 10,000 ft. of vertical displacement, is the area's principal structural feature. The highly faulted condition of the structure along the south of the fault zone, essentially a south-dipping homocline, makes it advisable to adopt a stepout development procedure. Detailed subsurface studies, continually broadened as more wells are completed, have resulted in very few dry holes being drilled, however. Search north of the fault zone has yielded only meager returns.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

COLORADO . . . McElroy Ranch has officially confirmed reports that casing will be landed at 1 City of Englewood, C SW SE 15-6s-69w, Jefferson County. The wildcat is drilling at 9,054 ft. and will be deepened about 200 ft. before casing is run. The test is 5 miles south and west of Littleton, and is the most southerly wildcat to be drilled in the deeper portion of the Denver-Julesburg basin.

WYOMING . . . Ohio Oil Co. has recovered a maximum of 1,400 ft. of heavy black oil on drill-stem tests in the Devonian for an apparent new pay discovery in Garland field, Big Horn County. The 6 Unit, SE Lot 58B, 28-56n-97w, is coring ahead in the Ordovician-Big Horn. There has been no previous Devonian production in Wyoming.

OKLAHOMA . . . Livon Oil Corp. and Helmerich & Payne, Inc., are installing pumping equipment for completion at a Major County Mississippian discovery at 1 Claude E. Reese, NE NE NE 18-21-11w, about 2 miles southwest of Ringwood pool. After acid treatment the well swabbed 85 bbl. of oil and acid water.

WEST TEXAS . . . Blanco Oil Co. and Newman Bros. Drilling Co. 1 S. M. Swenson, Kent County discovery, brought that county back into the exploration news. The Canyon reef strike was completed for a calculated daily flowing potential of 320 bbl. of 37.4°-gravity oil. It is 15 miles northwest of Claremont. A Tubb discovery was completed for a daily pumping potential of 33 bbl. of oil in Pecos County at San Juan Exploration Co. 1 Fannie Woodward, 7 miles south of Girvin.

Moffat Dome Gets New Oil Reservoir

Shinarump conglomerate discovery spurs interest in western Colorado

by Joseph A. Kornfeld
Mid-Continent District Editor

DISCOVERY of oil in commercial quantities from the Shinarump conglomerate at Moffat dome marks the first production from Triassic rocks for the White River uplift of northwestern Colorado.

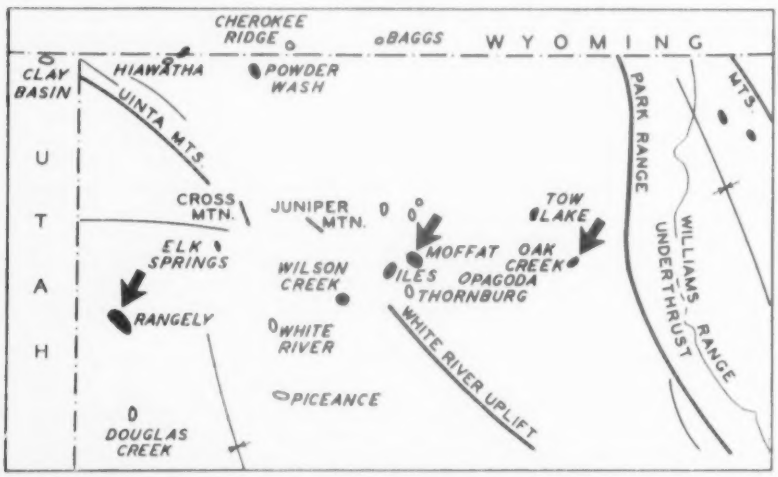
Oil recovery from Shinarump conglomerate was indicated from drill-stem test conducted during November 1953 at The Texas Co. 14 Knowlton, Lot 5, Section 9-4n-91w. On a 2-hour test at 5,273 to 5,301 ft. recovery in drill pipe was 2,600 ft. of free oil and 300 ft. of oil-cut mud. Recovery from a second and lower drill-stem test, from 5,330-47 ft., was 4,260 ft of water which was slightly oil cut. On last report, this well was drilling below 5,728 ft.

Successful completion of this well from the Shinarump conglomerate is certain to revive interest in this potential oil objective throughout western Colorado from the western slope area westward from the Park Range to Rangely. Only other oil-production completion in this region from the Shinarump is a single oil well at Rangely dome, Rio Blanco County, and a short-lived oil producer at Oak Creek anticline, Routt County. In addition, a commercial-size gas well was drilled during 1948 on the Pagoda structure in Routt County.

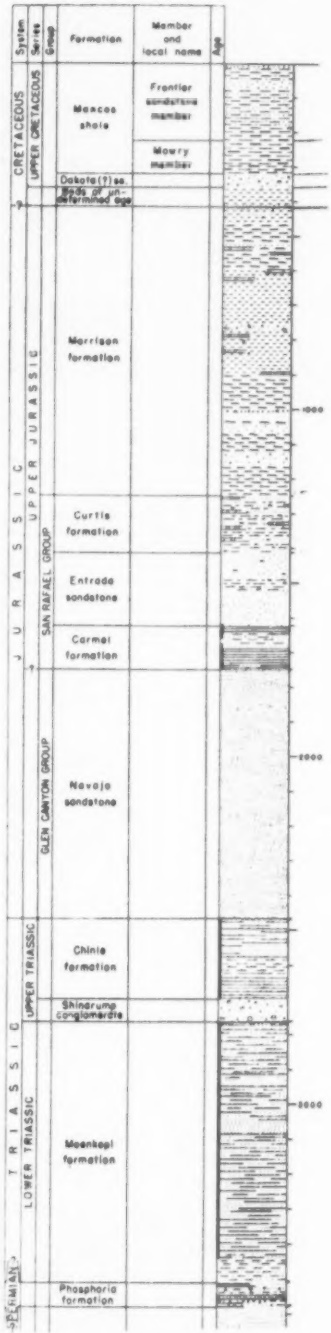
Moffat dome . . . The new test at Moffat will mark the deepest reservoir for this structure. Oil is produced from 4,000 ft. in Cretaceous Dakota sandstone and from 4,600 ft. in the Jurassic Entrada sandstone. Moffat dome is a pronounced asymmetrical dome with a closure of 900 ft. A few minor faults are observed at the surface.

Since discovery in 1923 to January 1, 1953, Moffat dome has produced 6,859,060 bbl. of oil. Present output is 157 bbl. daily of 38.6°-gravity oil produced from 10 wells. Crude is sweet and sulfur content is less than 0.1 per cent.

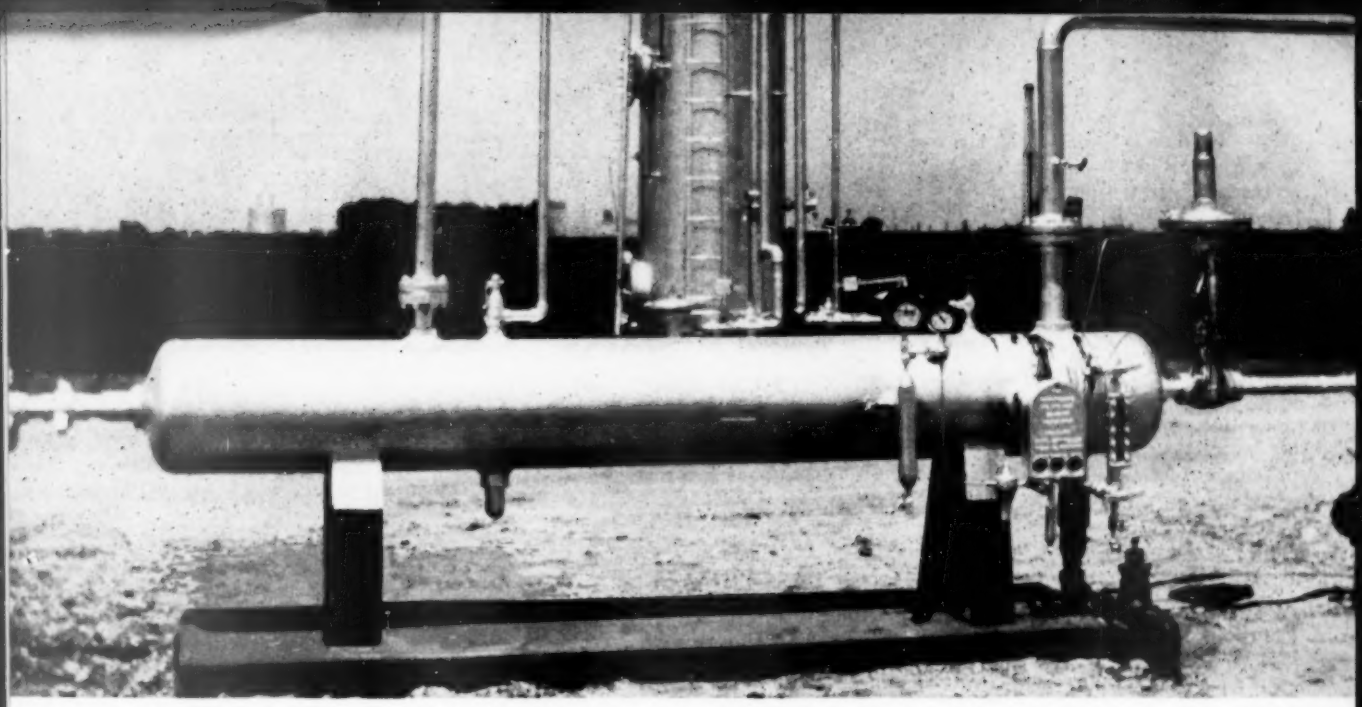
Rangely Shinarump . . . During 1948, a commercial oil well was completed from the Shinarump conglomerate to open a new reservoir on the northwest portion of the Rangely structure. Continental Oil Co. 2 Rooth blew out unexpectedly from a depth of 6,100 ft. while being drilled to the Weber sandstone. A string of 9⅝-in. pipe was set on top of the Shinarump conglomerate and the well completed for an initial of 113 bbl. of oil in 1 hour through a 44/64-in. choke. However, productivity declined rapidly and the well was put on the pump, averaging 150 bbl. a day for several months. It is



SHINARUMP CONGLOMERATE oil and gas discovery wells are shown by arrows on this regional map of northwestern Colorado fields and geologic features. Latest discovery at Moffat dome marks the deepest reservoir for that field. Other productive areas from the Shinarump include Rangely, Oak Creek, and Pagoda gas pool (shut in). (After USGS).



STRATIGRAPHIC POSITION of Triassic rocks, which include the Shinarump conglomerate, is shown by this columnar section at the outcrop measured on the south flank of Split Mountain, 26 and 27-4s-23e, Uintah County, Utah. (Courtesy C. R. Thomas, F. T. McCann, and N. D. Raman, USGS, 1945).



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Despite a field-wide program prepared by the Rangely Engineering Committee to evaluate this zone, no additional oil wells have been completed from the Shinarump although extensive coring and testing was done in a number of wells in that portion of the field. One source believes that the oil is not indigneous to the Shinarump and that it migrated upwards from the Pennsylvanian Weber sandstone along an undefined fault.

Shinarump conglomerate at Rangely is approximately 90 ft. thick. Lithology is argillaceous sand, conglomerate, and mudstone. Due to its lenticularity, it has been correlated as a basal phase of Triassic Chinle deposition[1].

Pagoda . . . Gas production from the Shinarump conglomerate was discovered on the Pagoda structure, Routt County, during December 1948 by General Petroleum Corp. at its 55-34 Government, NW NW SE 34-4n-89w. After drilling to total depth of 4,900 ft., it was plugged back to the Shinarump conglomerate encountered at 3,919 ft. and perforated from 3,957-90, 3,980-90, 4,002-26, and from 4,035-37 ft. Initial estimated open-flow potential by pitot-tube test was 7.7 M.M.c.f. of gas per day with flowing tubing pressure of 250 psig. and flowing casing pressure of 750 psig.; shut-in casing pressures rose to 1,300 psig. Due to lack of market, the well was shut in. Formation markers logged were: Mancos 640 ft.; Dakota 2,898 ft.; Lakota 2,995 ft.; Morrison 3,020 ft.; Chinle 3,550 ft.; Shinarump 3,919 ft.; Moenkopi 4,170 ft., and Weber 4,678 ft. (Surface elevation 8,085 ft. derrick floor).

Oak Creek . . . Oil production was discovered in the Shinarump conglomerate at Oak Creek structure, Routt County, during August 1949, 20 miles southeast of the Pagoda structure gas discovery.

Discovery was drilled on the Yampa anticline mapped and described in 1906 by the United States Geological Survey. Pre-Cambrian rocks outcrop only 4 miles east of the structure. Location was made on a northwest-southeast trending anticline with well side on the upthrown side of a high-thrust fault.

R. E. Havenstrite 1 Prentiss, NW SW NE 2-3n-86w, the discovery well, was completed for an initial oil production of 300 bbl. of 37.9°-gravity oil per day on the pump. Pay zone was from 6,670-99 ft. in Shinarump with 7-in. pipe set at 6,644 ft. The well produced a total of 30,717 bbl. of oil before it was shut down during 1951.

FORMATIONAL SEQUENCE
R. E. Havenstrite No. 1 Prentiss NW SW NE 2-3n-86w. Oak Creek field, Routt County, Colorado.
(Surface elevation: 9,000 ft. d.f.)

	Sample Top
Cretaceous:	
Mesaverde shale*	300
Frontier sandstone	5,340
Dakota sandstone	5,825
Morrison formation	5,900
Jurassic:	
Morrison sandstone	6,313
Triassic:	
Shinarump conglomerate	6,670
Shinarump pay	6,670-99
Total depth	6,749

*Mesaverde on outcrop at well-site.

The first confirmation test was a dry hole and the top of the Shinarump was found 70 ft. lower than the discovery.

Crude is a mixed base containing 2 per cent asphalt and 3.2 per cent paraffin. Gasoline content is 28.5 per cent. Viscosity is 46 seconds at 100° F. and 34 seconds at 210° F. Pour point is 50° F.

Stratigraphy

Thomas, McCann, and Raman[2] summarize the stratigraphy of the Triassic of northwestern Colorado as follows:

Chinle formation . . . The Chinle formation consists chiefly of calcareous shale, mudstone, and a few beds of fine-grained sandstone and locally lenticular, thin beds of limestone-pellet conglomerate. Red is the dominant color in this formation. Upper part of Chinle is chiefly red calcareous siltstone in the subsurface on Meeker and Wilson Creek domes and on the outcrop at Elk Creek. On the outcrop the formation thickens from 140 to 240 ft. in the northwestern part of the area to 380 ft. at Elk Creek. In the subsurface thickness of Chinle ranges from 160 ft. in Rangely oil field to 360 ft. in Wilson Creek oil field.

Shinarump conglomerate . . . The Shinarump conglomerate consists of interbedded lenticular beds of steeply cross-bedded sandstone and conglomerate composed chiefly of varicolored quartz grains. Grain size ranges from medium to pebbles as much as ½-in. in diameter; dominant pebble size is ¼-in.

In the subsurface, Shinarump has been recognized by presence of coarse sand grains and quartz pebble fragments at Rangely, North Douglas Creek, South Douglas Creek, Meeker, and Wilson Creek domes.

On the outcrop, it forms prominent ridges. At Vermilion Creek, the formation is a well-developed cross-bedded sandstone and conglomerate 53 ft. thick. However, at Cross Mountain it is a 10-ft. bed of fine to medium-grained white sandstone. It thins to only 2 ft. at nearby East Elk Creek and disappears at Elk Creek.

Moenkopi formation . . . Lowermost Triassic rocks represented in the area are the Moenkopi formation consisting chiefly of regularly bedded dull red shale, sandy shale, and fine-grained sandstone and siltstone. In the lower part are gray, greenish-gray and yellow shale, sandy shale, and sandstone; Gypsum stringers are frequent throughout the formation.

Formal thicknesses range from 600 to 800 ft. in the northwestern part. In the subsurface, the unit ranges from 590 ft. at Rangely to 200 ft. on South Douglas Creek anticline, disappearing at Elk Creek. In well cuttings, Moenkopi is not easily distinguished from the overlying Chinle formation.

References

1. Pickering, W. Y., and C. L. Dorn, "Rangely Oil Field, Rio Blanco County, Colorado," Structure of Typical American Oil Fields, A Symposium Vol. III (1948) pp. 132-152.
2. Thomas, C. R., F. T. McCann, and N. D. Raman, Mesozoic and Paleozoic Stratigraphy in Northwestern Colorado, USGS (1945), Sheet 2.

OKLAHOMA

Production Tests Set At Logan County Strike

Production tests in the Marshall zone are to be made at Randall R. Morton Drilling Co. and Walter Duncan, Jr. 1 Kime, NW SE NW 27-15n-1e, Logan County discovery.

The well flowed at the estimated rate of 25 bbl. of oil per hour on a drill-stem test taken by means of double packers at 5,400-5,440 ft. Recovery was 1,600 ft. of clean oil and 250 ft. of oil-cut mud.

Stepout Drilling in New Woods County Area

Peppers Refining Co. has a new stepout wildcat ½ mile south and ½ mile east of new Yellowstone pool in northern Woods County in northwestern Oklahoma.

Operations are under way at 1 Mayes, NE NE NE 20-29n-17w. Champlin Refining Co., who opened Yellowstone pool recently, has two offsets under way and nearing objective depths at 1 Geo. Dyer, NE SE NW 17-29n-17w, and 1 J. E. O'Donnell, NE SE SW 17.

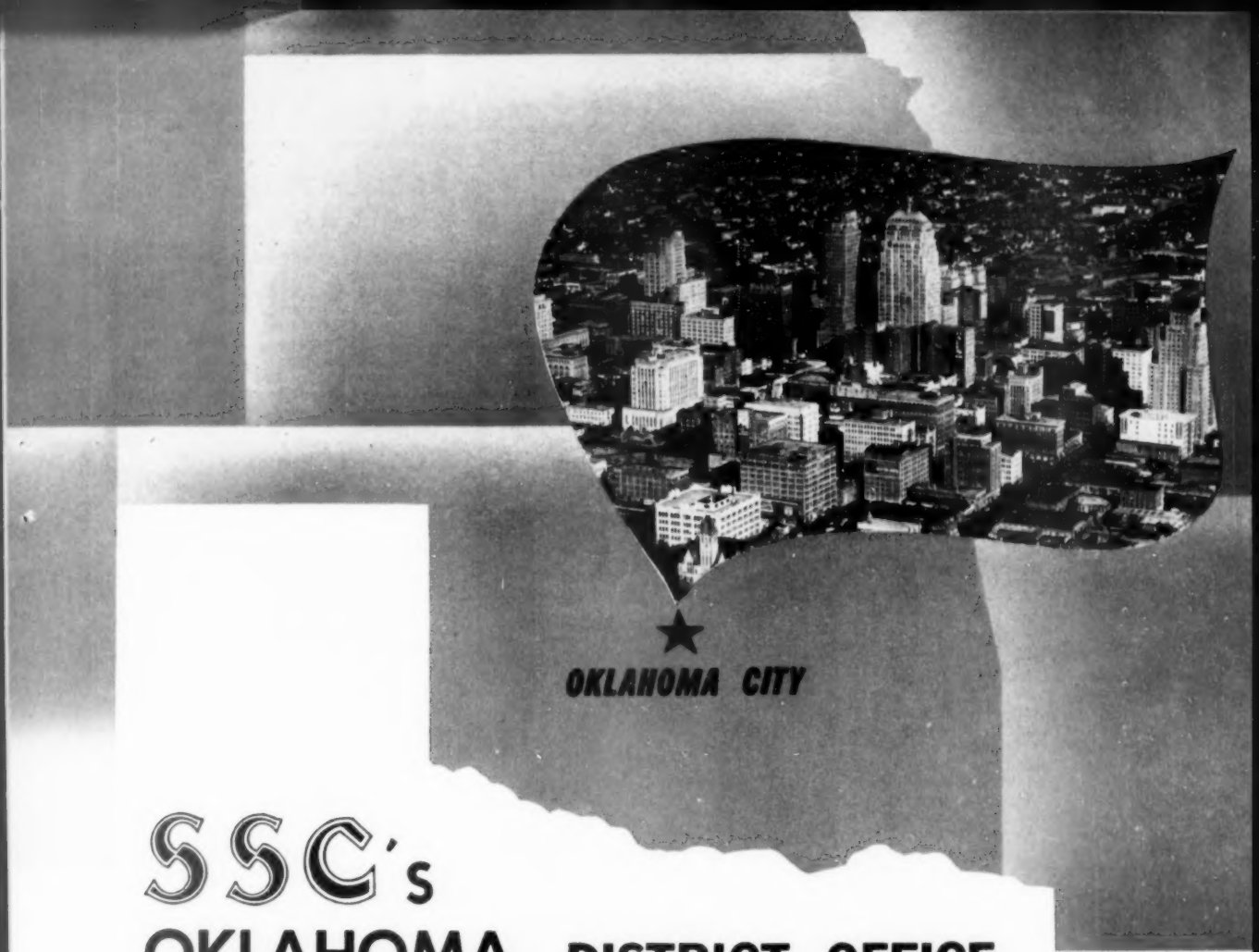
Champlin 1 Diamond, NE NE SW 17, was recently completed as one of the outstanding discoveries of 1953 for 25½ bbl. of 43°-gravity oil in 24 hours from the Arbuckle at 6,134-40 and 6,149-52 ft. Production tests were not made in the Simpson, Viola, and Mississippian, all of which had good productive indications. The new pool opened first oil production in Woods County and in this section of Oklahoma.

Logan Discovery Flows At High Hourly Rate

Production tests are proving good Marshall zone pay at Randall R. Morton Drilling Co. and Walter Duncan, Jr., 1 Kime, Logan County discovery well in the NW SE NW 27-15n-1e. The well swabbed and flowed 30 bbl. of oil per hour. It then flowed 50 bbl. of oil per hour for 5 hours on 16/64-in. choke. Testing continues. The new Marshall discovery is about 2 miles southeast of East Evansville pool.

Northwest Activity

Champlin Refining Co. is at critical stage in two confirmation tests in new Yellowstone pool. The 1 O'Donnell, NE SE SW 17-29n-17w, showed gas in 1½ minutes with volume gaged at 6,924 M.c.f. per day from the Arbuckle on drill-stem test at 6,005-60 ft. The well flowed distillate in 10 minutes and recovery was 60 ft. of clear distillate. A drill-stem test in the Simpson at 5,860-85 ft. flowed oil and water. Recovery was 1,130 ft. of oil and gas-cut salt water and 1,000 ft.



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of salt water. Another offset, the 1 Dyer, NE SE NW 17-29n-17w, is drilling below 5,956 ft.

CALIFORNIA

Two Deep Tests Staked In Rio Bravo Area

Two deep tests shortly will get under way in the Rio Bravo area of Kern County, one a wildcat almost 3 miles northwest of production and the other an extension attempt to a new 11,600-ft. pay.

Tide Water Associated Oil Co. will drill the former in NW 18-28s-25e, where it holds a sizable lease block. It is expected the test will be carried to a depth of about 13,000 ft. Site is about 1 mile southwest of a 12,600 ft. test drilled by Tide Water several years ago.

Superior Oil Co. was preparing to drill 38-34 Kernco in SE SW Section 34, about ¾-mile south of the Helbling sand (lower Miocene) discovery completed by Union Oil Co. in August. The deeper pool opener was completed flowing 330 bbl. of 34°-gravity crude through perforations at 11,662-98 ft.

Greenacres Discovery Is Completed

C. W. Teater completed 1 Teater-Billington as the discovery of Greenacres field, flowing about 200 bbl. of fluid daily with a 50 per cent water cut. Production was from 4,290-4,343 ft., reportedly in the Leido sand of upper Miocene age. Location of the discovery is in NE SW 19-29s-27e, about 1½ miles southeast of the Rosedale Ranch field.

Pipe Set in Pleito Creek Test

Humble Oil & Refining Co. has set a 7-in. liner in 16 K.C.L.-B, originally started as an Eocene test in the Pleito Creek field of southeast San Joaquin Valley. After being drilled to 14,935 ft., hole was plugged back to 8,301 ft. It then was redrilled to 8,803 ft. to take another look at a prospective pay encountered in the original hole. Existing production is from Chanac and Santa Margarita sands at about 4,000 ft.

New Gas Find Indicated

A new gas find was indicated by tests in W. W. Holmes, Opr. 1 Winkler, located about 1 mile southeast of the one-well Alpaugh gas field in Kings County. Drilled to 3,400 ft. and then redrilled to 2,901 ft., the well flowed at a daily rate of 2,000 M.c.f. when 5½-in. casing was perforated at 2,798-2,800 ft. Flow was through ½-in. surface and bottom-hole chokes. Site of the wildcat is in SW SW 28-23s-22e.

Pipe Set in Offshore Test

Monterey Oil Co. was preparing to test shows in its West Newport wildcat, which is bottomed under the Pacific Ocean. Nature of the shows encountered have not been released. The wildcat, a joint venture with Humble Oil & Refining Co., was first drilled to 7,125 ft. It then was redrilled from about 1,100 ft. to the current bottom of 4,518 ft. where pipe was set.

Puente Hills Test Setting Pipe

Tide Water Associated Oil Co. has run 7-in. casing in 1 Bryant Ranch, in Puente Hills near the Los Angeles-Orange County line. Pipe was run after a formation test failed at 5,913 ft., total depth. Located in NW SE 21-3s-8w, the test apparently is associated with the Whittier fault.

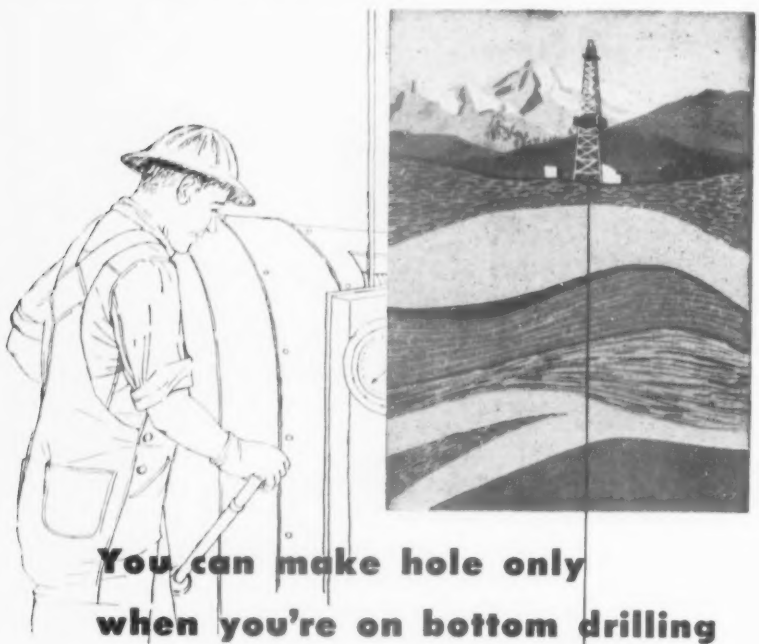
MICHIGAN

Lawton Traverse oil field, Van Buren County, took on the aspect of even greater development this week as two key wells were tested in the objective pay horizon with commercial production assure, on the basis of pre-completion information.

Along with other recent completions, and with these two new wells, the pool is almost certain to develop into an area of nearly continuous production from the southwest corner of Section 18 to the north half of Section 5, on a north-south strike, and from the west half of Section 8 to the boundary line east into Section 9, on an east-west strike. This is an exceptionally large area in recent years for a southwestern Michigan shallow oil pool. Production is from a depth of approximately 1,200 ft.

One of these key wells now under test is on the extreme east central side of Section 8, while the other is scheduled to be a connecting link between the older Section 18 area and the newer, 1953, development in Sections 8 and 5.

Norman L. Steven, at the 1 Hazelton-Quering, NE SE NE 8-4s-13w, Porter Township, Van Buren County, had the well which will probably push production to the east. Well was being tested after a 1,000-gal. acid



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Diamond Drilling Bits

by

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treatment to 250 ft. of free oil which showed natural in 18 hours at 1,195 ft., total depth. Pay was from the top, 1,194 ft., to the total depth.

Ford Oil Co. was testing the 1 Snyder, NW SE NW Section 17-4s-13w, the "in-between well," with hole showing 350 ft. of free oil natural on an overnight fill-up test, which had been acidized with 1,000 gal. at 1,156 ft., total depth. Daily average production from Lawton pool, with approximately 30 wells on production, was at 700 bbl. early this month.

At least seven new locations had been staked in the pool this week by Stevens, and Ford Oil was certain to start additional tests around the 1 Snyder where company controls approximately 300 acres of close-in leases.

TEXAS

EAST TEXAS

Deep Test Scheduled In Cherokee County

Sunray Oil Corp. 1 M. C. Chiles, William George Survey, A-295, in extreme northern Cherokee County, will be drilled to 9,300 ft. Location is about midway between North Jacksonville (Woodbine) and the Rusk County portion of East Texas field, and 2 miles southwest of the town of Troupe.

Another wildcat for the county is W. C. Proctor 1 A. & M. College, projected to 5,400 ft. in the T. M. Dement Survey, A-239, 1½ miles east of Maydelle townsite. Location is 6½ miles northwest of Rusk pool.

Oil discovery in Blocker field . . . La Gloria Corp. 1 G. S. Weir, Pettit oil discovery in a gas field, developed 220 ft. of oil and 25 ft. of mud on a drill-stem test in the Travis Peak between 6,537-86 ft. After drilling ahead to 6,705 ft. and setting pipe, a test on perforations between 6,390-99 ft., identified as the Page section, produced gas at the rate of 10,348,000 cu. ft. daily.

Kaufman County . . . Thomas D. Humphrey & Sons had a new pay in prospect 1½ miles northeast of Ham Gossett field. The well is 1 Walter Williamson, Timothy DeVore Survey, which recovered 1,830 ft. of oil and 150 ft. of mud-cut oil on drill-stem test in the Woodbine at 3,373-78 ft. Second test of the Woodbine from 3,378-88 ft. had flowing oil in 30 minutes, which was not gaged nor estimated. Further oil saturated sand was cored to 3,395 ft.

Pay section in 1 Williamson is from the lower Lewisville section of the Woodbine. Top on the Woodbine was 3,267 ft.

WEST TEXAS

Kent Wildcat Is Completed As Canyon Reef Discovery

Blanco Oil Co. and Newman Brothers Drilling Co. 1 Swenson, 3-2-H&GN, 15 miles northwest of Claremont and about 4 miles northwest of nearest Canyon production in Salt Creek field, has been completed as a flowing well.

Top of Canyon reef pay was placed at 6,634 ft., minus 4,453 ft. and casing was perforated between 6,639-55 ft. After acid treatment the section flowed at the rate of 320 bbl. per day of 37° oil per day with no water, through ¼-in. choke.

The well also flowed oil on a drill-stem test in Canyon sand between 6,102-36 ft. Estimated flow rate on this test was 15 bbl. hourly.

Kent County drilling has increased over the past few months, there being five other active wildcats in the county.

Gaines County Wildcat Slated for Dual Completion

O. D. Alsabrook 1 Riley Estate, northwest Gaines County wildcat, developed a good flow of oil on drill-stem test in Devonian rocks and operators have announced plans for dual completion. The well previously flowed an estimated 40 bbl. an hour from Wolfcamp limestone at 9,879-9,963 ft.

Top of the Devonian has been reported at 11,135 ft. by electric logs. A drill-stem test of open-hole section between 11,132-11,185 ft., total depth, had flowing oil in 84 minutes, and gaged 137.3 bbl. of new oil with no water in 5 hours.

Upton County . . . Gulf Oil Corp. has completed 3 McElroy Ranch as an extension and new pay well in the Adamc field. Potential from the Ellenburger was 761.76 bbl. of 53° oil a day through ⅜-in. choke from perforations at 11,575-11,675 ft., and from the Silurian at 10,615-10,649 ft. potential was 919 bbl. of oil a day through 16/64-in. choke.

Gulf 1-AE TXL, wildcat northeast of Adamc pool in Section 31, flowed 88 bbl. of 50° oil in 3 hours on drill-stem test of the Devonian between 10,980-11,081 ft. A 3½-hour test between 11,136-11,176 ft. did not flow but recovered 706 ft. of clean oil and 350 ft. of heavily oil-cut mud. Operators were drilling ahead below 11,204 ft. in lime and chert. This well also flowed from the Pennsylvanian at 9,170-9,220 ft.

NORTH TEXAS

Montague Strike Rates High Potential

P-M Drilling Co. 1 T. M. Collier has added another conglomerate producing structure to the area southwest of St. Jo. The well found top of pay at 6,652 ft. and from 20 ft. of perforations produced 325 bbl. of oil a day through 20/64-in. choke. Gas-oil ratio was 960 cu. ft. and gravity was 42°.

Location of the discovery is in the J. Collier Survey, A-1213, and is the first activity in that area following development of a small conglomerate pool about 3 miles north in the Joseph McCollier Survey.

New exploratory work in Montague County included a 6,000-ft. wildcat by San Juan Drilling Co. as 1 Will Laird, 5 miles west of Sunset in the Franklin Cook Survey, A-139.

Merle F. Gunby has announced location for 1 Mrs. Susie Melton et al as a 6,500-ft. wildcat in Abel A. Lewis Survey, A-420. Location is 5 miles northwest of Stoneburg.

Jones County . . . W. E. Butler 1 Allred, offset to Geochemical Survey Co.'s recent discovery 4 miles southwest of Truby, flowed 199.5 bbl. of oil in 10 hours through 20/64-in. choke from perforations in the Strawn at 4,561-69 ft. Top of the Strawn was 4,558 ft. Location is in 7-17-T&P Survey.

Nolan County . . . U. S. Smelting, Refining & Mining Co. 1-A TXL, ½-mile north extension prospect to Dora North-Ellenburger field in northeastern part of the county, flowed 63 bbl. of oil in 3 hours on drill-stem test in the top of the Ellenburger at 5,900-36 ft. Operators recovered an additional 5 ft. of good porosity and saturation in coring to 5,952 ft. This well also had flowing oil in a Caddo reef lime section topped at 5,830 ft., which if produced will be a second pay zone for the field.

TEXAS GULF COAST

North Buna Development Gets Ninth Oil Producer

Ada Oil Co. and Hurt Oil Co., Ltd., joint operators, are giving North Buna field, in Jasper County, another good producer with completion of their 6 Hardy Richardson.

The new well, which flowed on pre-potential tests at the rate of 6 bbl. of oil per hour through ¼ and ⅜-in. chokes, is the sixth producer for these operators, and the ninth for the field. American Republics Corp. and Houston Oil Co. of Texas have three of the wells. The field was discovered by the former operators last January.

Production is from the Yegua formation with two zones already open, one at 7,200 ft. and the other at 7,575 ft. The new well produces from the shallower zone, open through casing perforations at 7,214-20 ft.

SOUTHWEST TEXAS

Oil Discovery Confirmed In South Robstown Field

Warren Oil Corp.'s recent discovery of oil production in South Robstown field, Nueces County, is being confirmed at an offset well being completed by Arnold O. Morgan.

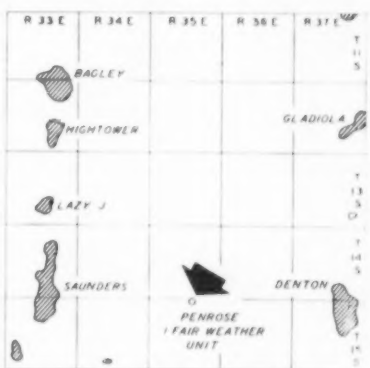
Morgan's well, 1 Wright, 934 ft. from the discovery producer, filled 3,200 ft. of pipeline oil in a drill-stem test at 5,590-94 ft. in the discovery well's pay zone. The test was through ¾-in. chokes with bottom-hole pressure of 1,495 ft.

Hole was carried to 5,655 ft. after the test and casing run through the pay for completion.

The discovery well, 1 Halpert, completed last September, produced from an interval at 5,598-5,604 ft.

Prior to Warren's oil discovery, the field had one gas well, Southwestern Oil & Refining Co. 1 Ruegg, dually completed in sands at 6,904-07 ft. and 5,603-06 ft.

NEW MEXICO



Neville C. Penrose, Inc., 1 Fair Weather Unit in central Lea County, Southeast New Mexico, indicated discovery production from the Cisco limestone of upper Pennsylvanian age. Total depth was 14,690 ft. in Devonian rocks, plugged back to 11,098 ft. The well flowed 141 bbl. of oil in 19 hours from perforations between 11,000-11,034 ft. The two north-south trends of fields shown on the map are all pre-Permian production.

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ROCKY MOUNTAIN

WYOMING

Big Horn Basin Well Finds Devonian Oil

Ohio Oil Co. recovered 1,400 ft. of oil on drill-stem test of Devonian at a deep test in Garland field, Big Horn County indicating the possibility of the first commercial recovery from this formation in the state.

The well is 6 Unit, SE Lot 588, 28-56n-97w. Top of Devonian was found in samples at 4,186 ft. Test 4,191-4,302 ft. recovered 60 ft. of oil-cut mud and 270 ft. of mud cut heavy black oil. A second test 4,303-4,407 ft. made 1,400 ft. of black oil and 60 ft. of oil-cut mud in 1 hour. Ohio is reported coring ahead in the Big Horn member of Ordovician at about 4,521 ft. The well is to go to basement expected at about 6,100 ft.

There has been no previous show of significance in Devonian rocks in Wyoming. Deposition is limited generally to the northwestern quadrant of the state, with Devonian absent in most oil producing areas.

Natrona County Confirmation

Superior Oil Co. has made location for 16-14 Government, SW NW SW 14-27n-85w in the Okie Draw area of Natrona County. The well is to be an attempted confirmation to Superior's apparent Phosphoria discovery at 36-14 Government, SW NE SW 14-37n-85w. The first well was unofficially reported to have made commercial quantities of oil from Phosphoria, but the operator has not confirmed reports of success, despite the fact that a second well has been located.

Southeast Sand Draw Attempts Completion

Sohio Petroleum Co. has plugged back to 8,629 ft. at 1 Unit, SE NW SE 36-32n-95w, in the Southeast Sand Draw Unit, Fremont County and will attempt to recomplete in Phosphoria. The well was completed as a Tensleep discovery with a gage of 270 bbl. of 17°-gravity oil per day from that formation which was topped at 8,600 ft. Due to the low gravity, a market has not been available. Shows of apparently commercial value were found in Phosphoria with a higher gravity indicated.

Beaver Creek Deep Test in Objective

Stanolind Oil & Gas Co. has topped Madison at 30-M, S½ NW NE 10-33n-96w in Beaker Creek field, Fremont County. The well is the first to penetrate beyond Tensleep in the field which produces from five shallower zones. Stanolind is coring below 11,195 ft. Production was found in Tensleep, already one of the established producing horizons. Madison top is at 11,189 ft.

NORTH DAKOTA

Second Fryburg Well Recovers Oil From Heath

Amerada Petroleum Corp. reported recovery of 2,114 ft. of black gravity oil on drill-stem test of 1 Franchuk, C NW SW 10-139n-100w in the Fryburg area, Billings County. The well is the second in the area to find commercial indications in the Heath. Test was run of the zone 8,194-8,257 ft. and tool was open 4 hours. Included with the oil was 254 ft. of highly oil and gas-cut mud, estimated 20 per cent oil, and 182 ft. of highly gas-cut and slightly water-cut mud. Top of Heath was found at 8,196 ft. The operator is drilling below 8,514 ft.

The well is 1 mile southeast of the second well drilled in the area 1 Logan, C SE SW 4-139n-100w, which also found Heath shows of possible commercial significance, but was completed in Madison. The discovery well at Fryburg was a Madison completion.

Dunn County Wildcat Staked

Socony-Vacuum Oil Co. has announced location for F-42-6-P Socony-Dvorak, C SE NE 6-141n-94w, in the Emerson area of Dunn County. Objective is the Nisku (Devonian) expected at about 10,400 ft. Location is on seismic prospect. The operator controls about 57,000 acres in the area. It is 36 miles northeast of production in the Fryburg area of Billings County.

Stanolind Has First North Dakota Success

Stanolind Oil & Gas Co. recovered 80 bbl. of 42.6°-gravity oil in 2 hours through ¾-in. choke on test of Three Forks member of Devonian at 1 Starr, C SW SE 21-152n-94w, McKenzie County. Test was through perforations 10,526-10,556 ft.

An earlier test of the interval made 34½ bbl. of oil in 7 hours and 47 bbl. in 14

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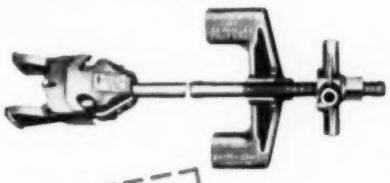

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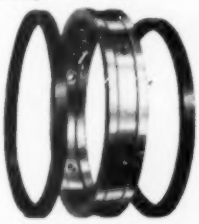

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hours, with the flow by heads. The well was not acidized, as has been the general practice in the area, but was fractured. This is the first use of this process in western North Dakota. A considerable amount of fracturing has been done in other Rocky Mountain areas, particularly in Wyoming with results generally considered gratifying. The apparent discovery, which is 12 miles east of previous production, is shut in for storage.

SOUTH DAKOTA

Shell Oil Co. is reported swabbing about 1 bbl. of salt water per hour at 1 State-A, C SW SE 9-21n-4e in the Custer area of Harding County. Test was of perforations 8,715-45, and there was no oil in recovery. The well made oil in drill-stem test of two zones in Red River, and has been of interest as South Dakota's first commercial possibility. The operator is continuing to test.

COLORADO

Denver Area Wildcat To Run Casing

McElroy Ranch Co. has confirmed reports that casing will be set for further testing of 1 City of Englewood, C SW SE 15-6s-69w, Jefferson County. The well is about 5 miles southwest of Littleton, Denver's southern suburb. Shows were reported in cores of Dakota from 8,994-9,054 ft. Core description has not been released by the operator, and attempt to run drill-stem test failed. The operator has announced intention of deepening about 200 ft. below 9,054 ft. and setting pipe.

The well is the first deep test this close to the mountain front in the current exploratory program in the Denver-Julesburg basin. Trend of activity has been to the south and west in recent months, with the Denver Low the only area not yet subjected to extensive exploration, although large tracts were leased through the area following discovery of Permian production in the basin earlier this year.

Roggen Area Extension Is Success

Twin Oil Corp. reported a flow estimated at 18 bbl. per hour on drill-stem test of D sand at 1 Henry Zimbleman, NE SW NE 22-2n-63w, Weld County. The well is an offset to the discovery in Southwest Roggen pool recently made by Spears and Colorado-Wyoming Oil Co. Production in the discovery well was the first in the area from D sand, although production was previously found in the J sand.

Twin Oil ran test of the interval 7,053-73 ft. and oil flowed after 65 minutes of the 1¼-hour test. Meanwhile, Spears and Colorado-Wyoming completed their second failure since the discovery at 2 Henry Zimbleman, SW NE NE 22-2n-63w. Very little D sand development was found in this well, and no shows of significant value were found in the deeper J sand. The discovery well in the same section is now producing 300-400 bbl. of oil daily in 6 hours of flow through ½-in. choke.

Morgan County Activity Up

The southwest Morgan County area had three wildcats and two extensions staked during the past week. The area was the scene of both a D and J sand discovery during November. Lion Oil will offset the Adena area discovery in 12-1n-57w, and Pure Oil will drill an offset to the North Adena J sand discovery in 24-1n-58w. Three independents made locations for wildcats to the north and east of the two recently opened pools.

NEBRASKA

Chadron Arch Drilling On Increase

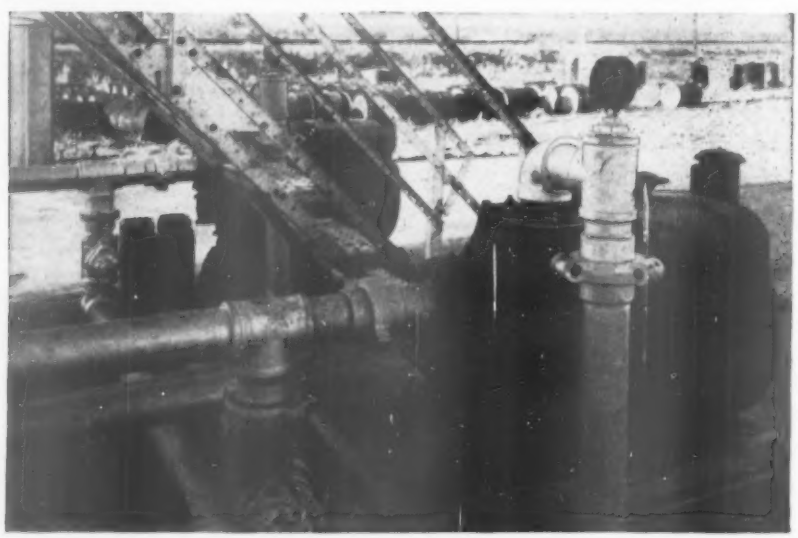
Gulf Oil Corp. is drilling at 1 Olbricht, SW SW NW 33-30n-53w, Sioux County. The well is one of a series which the operator has drilled through the general area. The company recently abandoned a failure at 1 Jones, SW SW NW 3-29n-52w, Dawes County, with no shows reported. East of the Gulf Oil wildcat Cree Drilling Co., Inc., has made location for 1 State, C SE SE 16-29n-49w in Dawes County. The wildcat is on Shell Oil Co. farmout.

APPALACHIAN AREA

OHIO

Oxford Oil Co. stepped out ½ mile southwest of old Roseville pool and completed a fair well on Prudence Larzelere, Section 4, Harrison Township, Perry County. Clinton sand at 3,533-3,583 ft. was fractured and produced 45 bbl. in 24 hours.

Three wells were completed in Jackson Township, Knox County. Mutual Oil and Gas 2 Nellie Wright, Section 11, a ¼-mile extension, logged Clinton at 3,144-3,204 ft., with 3 bbl. natural and 75 bbl. in 24 hours after fracturing. Leonard Blood 3 Otto Davidson, Section 20, made 175 bbl. after fractur-



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ing sand, found at 3,104-3,147 ft. Preston Oil Co. 6 Glenn Morris, Section 24, made 207 bbl. in 24 hours after treating sand, found at 3,031-3,075 ft.

PENNSYLVANIA

In Springfield Township, Fayette County, southwest Pennsylvania, Peoples Natural Gas Co., has made a location for its 1,4030 F. K. Buttermore heirs, wildcat, elevation 2,272 ft., Connellsville Quadrangle, 4.61 miles south of latitude 40 degrees 5 minutes and 1.48 miles west of longitude 79 degrees 30 minutes. This location is approximately ¼ mile northwest of the well recently completed on the same tract by Acme Die & Machine Co., which was dry at a depth of 7,861 ft., recording only the Tully lime at 7,722 ft. Buffalo Township, Washington County, Washington Oil Co. 1 Kelly-Southerland, is drilling at 6,821 ft. Unity Township, Westmoreland County, Peoples Natural Gas Co. 1-4017 J. A. Mills, is at 3,686 ft.

Moorfield district, Hardy County, United Fuel Gas Co. 8011-T H. & E. Davidson, wildcat, which topped the Oriskany sand at 6,947 ft., had a show of gas gaging 39,000 cu. ft. at 7,032 ft., which soon blew out. Drilling is at 7,066 ft.

CANADA

Six New Strikes Reported In Western Canada Area

During the past seven days there were six new discoveries recorded in western Canada, including two oil strikes and four new gas finds. Four of this week's discoveries came in Alberta, while the other two were in Saskatchewan.

In addition, this week brought news of two more indicated oil extensions or discoveries at step-out tests in the Pembina area of central Alberta, where prospects are bright for one or more major oil reservoirs.

The Alberta discoveries include on oil and three gas strikes. The oil discovery was made by Canadian Gulf Oil Co. at its wildcat in the Little Smoky River sector of Sturgeon Lake, in northwest Alberta. This venture, Gulf 12 Little Smoky, LSD 12, 27-67-22w5, is 9¼ miles south-southwest of Amerada oil production at Sturgeon, and 170 miles northwest of Edmonton.

First report from the well, obtained earlier this week, and as yet unconfirmed by Canadian Gulf, indicated that a drill-stem test from 8,755 to 8,765 ft. flowed natural gas at rate 584,000 cu. ft. daily and yielded a recovery of 650 ft. of light-gravity crude oil. That test was run in the approximate top 10 ft. of the D3 Devonian coral reef, placing the reef contact around 300 ft. lower in elevation than the closest Amerada oil well which found about 180 ft. of oil zone above water.

It is understood that additional drill-stem tests have been run at this discovery well, but Gulf has not as yet released any results of those tests. The well is currently reported coring below 8,793 ft.

One of the week's gas discoveries—at a wildcat that had previously discovered natural gas—was chalked up as a triple zone gasser, having found two more productive horizons. That well, California Standard Co.'s 5-14 September Lake, LSD 5, 14-67-25w4, 22 miles northwest of Athabasca town, this week reported gas in the basal quartz section of the Lower Cretaceous and the D1 zone of Devonian. Previously a sand higher in the Cretaceous had flowed natural gas at rates up to 2,440,000 cu. ft. daily—during tests between 1,920 and 1,962 ft. The basal quartz gas was found during test from 2,549 to 2,570 ft. Flow rate was 1,425,000 cu. ft. per day during 1 hour test.

In the D1, during tests between 2,582 and 2,614 ft., gas ranged up to 2,000,000 cu. ft. daily. Hole is now deepening for its lower objectives, and is making hole below 2,785 ft.

This week's other Alberta gasser is being drilled by Husky Oil & Refining, Ltd., on farmout lands from Canadian Gulf Oil Co. and Canadian Superior Oil of California, Ltd., in the North Stettler area, 5 miles northeast of Erskine D3 oil field. This strike, Husky-Gulf-Canadian Superior 1 North Stettler 1, LSD 14, 28-39-20w4, found its gas during tests in the basal quartz between 3,784 to 3,825 ft. Flow rates ranged up to 4,330,000 cu. ft. daily, and last test in the zone gave up some formation water, indicating that from 15 to 25 ft. of gas section was present. Hole is being taken down to test the Cretaceous and D3 Devonian equivalent. The Saskatchewan oil and gas discoveries this week came at one well—a test in the northern area of Gull Lake medium gravity oil field in the southwest portion of the province.

This well, owned by Gridoil Freehold Leases, Ltd., 15-23A, is Gull Lake, LSD 15, 23-13-19w3, 33 miles southwest of Swift Current and ¼ mile west of an upper Shaunavon formation oil producer.

The gas strike was made in the basal Cantuar during test from 3,485 to 3,520 ft. Flow rate was in excess of 9,000 M.c.f. daily.

The oil was found when 1-hour drill-stem test in the Middle Vanguard (top of Jurassic), from 3,535 to 3,553 ft. yielded 2,333 ft. of 20°-gravity oil. The well also found oil in the upper Shaunavon zone and will be completed as a producer from that horizon. A further well will be drilled at a latter date, to tap the mid-Vanguard oil.

The two indicated extensions include the Socony-Seaboard-Merrill group's No. 12-12

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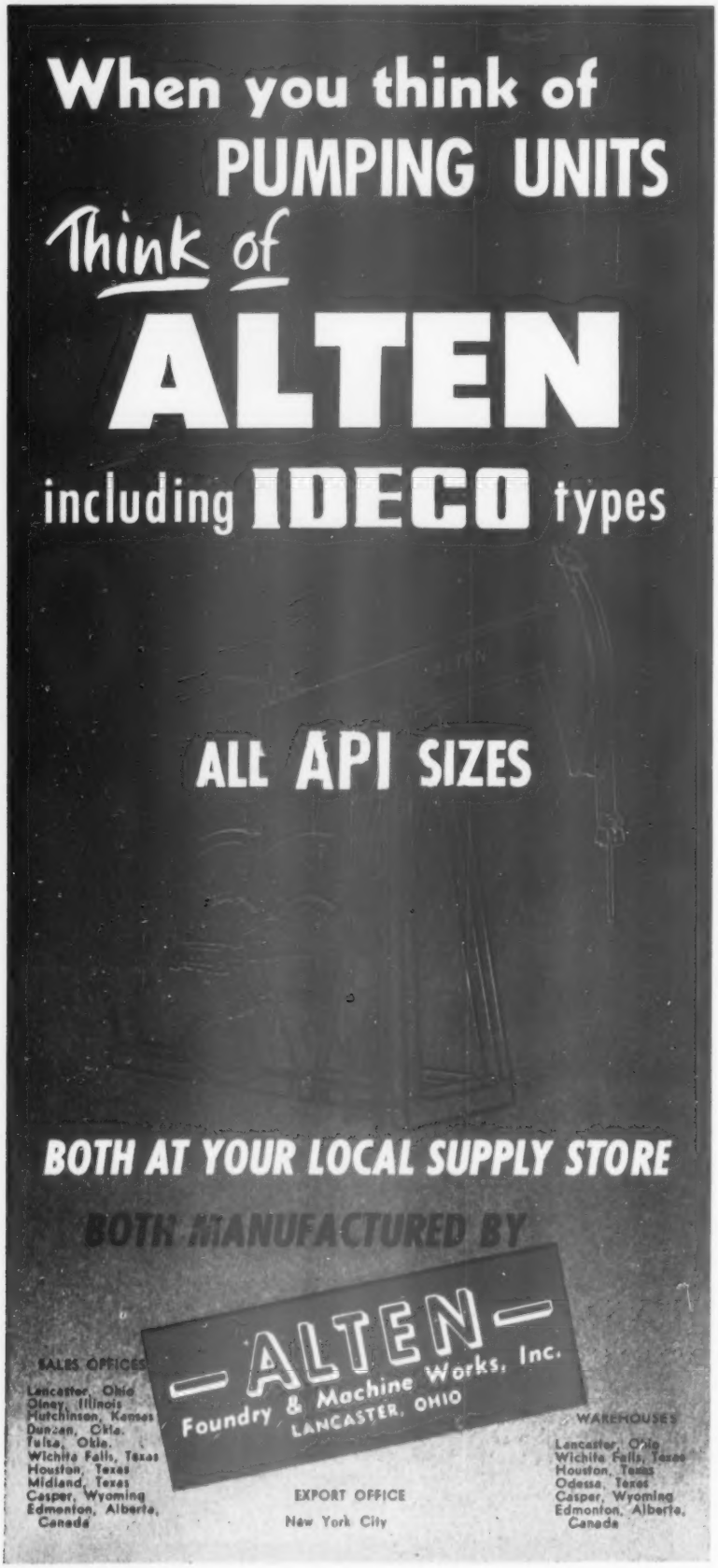

well at Pembina, LSD 12, 12-48-8w5, 3 miles east-southeast of the southern Pembina oil discovery, which has drill-stem tested 40 ft. below the Cardium sand top, and as yet has not fully penentrated the oil pay; and the group's Violet 30-2 Grove venture, 3½ miles northeast of No. 12-12, on LSD 2, 30-48-7w5, which has tested 31 ft. below the Cardium oil sand contact, and is still recovering clean oil. Coring and testing is being continued at both step-out wells.

KANSAS

Finney Discovery Goes On Pump After Swabbing

W. I. Hartman is setting up pumping equipment at 1 Holstead-Thomason, SW SW SW 25-22s-33w, wildcat 1½ miles east of Finnup pool in northwestern Finney County, after swabbing 8 bbl. of oil per hour. The Marmaton was perforated at 4,442-50 ft. and swabbed 1½ bbl. of oil per hour and no water. Acid treatment increased this to 8 bbl. per hour.

Pawnee Strike Reports High Hourly Flow

Testing continues at GMR Oil Co. 1 Dufford "A," SE SE SE 7-21s-15w, Pawnee County wildcat 1¼ miles southwest of Sweeney pool and 1¼ miles southeast of Ash Creek pool.

A flow of 1,000 M.c.f. of gas per day and 15 bbl. of oil per hour were reported in the Arbuckle through perforations at 3,842-46 ft. A gas flow of 15,000 M.c.f. per day was reported prior to recementing of 5-in. casing.

Three Strikes Finaled

Decatur County has a new discovery at M. B. Armer 1 Schultz, NE NE SW 5-3s-29w. The pool opener was finaled for a pump potential of 243 bbl. of oil per day from the Lansing lime.

Pawnee County has a good new pool opener at GMR Oil Co. 1 Aldrich, SE SE NW 3-23s-16w, finaled with a bomb potential of 1,458 bbl. of oil per day from the Lansing.

Stafford County's newest oil pool was opened by NCRA at 1 Slade, SW SE SW 23-25s-12w, with a flow potential of 108 bbl. of oil per day from the Lansing.

Morris Hit Hinted

Oil String casing is set and production tests are due at an indicated discovery in eastern Kansas' Morris County. The hinted strike is W. Grunerwald 1 Williams, NW NE NW 26-15s-9e. Recovery on a drill-stem test at 3,090-96 ft., open 2 hours, was 1,360 ft. of oil and 40 ft. of muddy oil from the Viola lime.

The wildcat is 11 miles southeast of Alta Vista gas pool and 7 miles northeast of Council Grove, Kansas.

ILLINOIS

Noah Petroleum Co. has completed 1 Berry, SW NW NE 30-1s-12w, for an initial production of 205 bbl. of oil per day natural from the O'Hara lime at 2,413-19 ft. The well is 1½ miles from good production at the

southwest edge of Mt. Carmel in Wabash County.

Coy Oil, Inc., has set casing at Heitman et al, NE NE NE 1-5n-6e, Clay County, to test the McClosky lime at 2,832-38 ft. A 1-hour drill-stem test recovered 1,030 ft. of clean oil, 20 ft. of mud-cut oil. The well is 3 miles northwest of Bible Grove.

In Lawrence County, John M. Zanetis 1 Webster, NE NW SE 8-2n-12w, 8 miles southwest of Lawrenceville, is testing the Rosiclare lime at 2,273-78 ft. A drill-stem test gassed in 11 minutes and flowed clean oil in 55 minutes.

KENTUCKY

EASTERN KENTUCKY

In Big Sandy gas field and located in the Letcher County sector, Kentucky-West Virginia Gas Co. has completed 6151 Jas. B. Taylor on Camp Branch as a Devonian black shale gas well. Bottomed at 3,606 ft. well gaged on open flow 311,000 cu. ft. of gas daily after a 6,400 lb. shot of gelatin.

In Pilot Pool astride the Wolfe and Powell County line, Albert Dodge has completed 42 J. B. White heirs as a small oil well from the Corniferous lime at a depth of 983 ft. Top of formation was encountered at 874 ft.

WESTERN KENTUCKY

Magnolia Petroleum Co. 2 Mrs. J. H. Gabhart, 20-P-21, Henderson County, is a big success. The well flowed 3,004 bbl. of oil in 24 hours from the McClosky lime at 2,602-10 and 2,625-26 ft. The well is still making about 180 bbl. of oil per day.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

Atascosa County: B. A. Baker 1 Knowlton, Dolores Alderete Sur. 1211, A-26. Dry. TD 2,578 ft.

Duval County: Blair-Vreeland 1-B Lloyd & Lloyd, BS&F Sur. 67, A-90. Dry. TD 2,826 ft.

Hidalgo County: The Texas Co. 3 McAllen, Santa Anita Sur., A-63. Dry. TD 9,300 ft.

Jim Wells County: Panhandle Oil Corp. 1 Reynolds et al, J. Poitevent Sur. 203, A-369. Dry. TD 5,711 ft.

Kenedy County: Humble Oil & Refining Co. 1-G John G. Kenedy, Jr., La Parra Grant. Dry. TD 10,930 ft.

McMullen County: Appell Oil & Gas Corp. 1 Atkinson, W. Marquis Sur., A-1099. Dry. TD 8,514 ft.

J. R. Butler 1 Hays-Ezzell, Section 5, Hays-Ezzell Subd. Dry. TD 2,500 ft.

Starr County: W. H. Wilson and W. H. Holland 1 Juan de Dios Velva, Share 2-A, Porcion 91. Dry. TD 3,392 ft.

Webb County: Harold K. Boysen 1 Killam-Bruni, Lot 32, Brown Subd., Albercas Grant. Dry. TD 2,681 ft.

Long Brothers et al 2 Wilmott estate, W. S. Vanover Sur. 201, Certificate 594. Dry. TD 2,665 ft.

O. W. Killam 2 Walker, CCSD&RGNG Sur. 52. Dry. TD 3,060 ft.

Texas Eastern Production Co. 1 Moos, CCSD&RGNG Sur., A-2400. Dry. TD 2,530 ft.

Willacy County: Fitzpatrick Drilling Co. 1 Stone et al, San Jaun de Carricitos Grant, Share 45. Dry. TD 8,505 ft.

Wilson County: C. C. Winn 1 McCracken, L. Manchacha Grant, A-18. Dry. TD 2,750 ft.

Zapata County: Appell Oil & Gas Corp. 1 Vela, Black 57, Foster Subd., Share 2, El Grullo Grant. Dry. TD 3,720 ft.

John F. Camp & Sons 1 Trevino Sisters, T&NO Sur. 6, Certificate 12-2542. Dry. TD 1,999 ft.

Zavala County: C. G. Dunwoody 1 Cross S. Ranch, Inc., Blk. 48, Cross S. Ranch Subd. Dry. TD 3,500 ft.

TEXAS GULF COAST

Bee County: Coates, Kirkpatrick & Whitaker 1 Fox et al, R. and M. Quirk Sur., A-56 (northwest of Blanconia field). Dry. TD 4,900 ft.

H. R. Smith 1 Mayfield, Sec. 90, George H. Paul Subd., J. J. Welder Ranch. Dry. TD 5,750 ft.

Brazoria County: Pan American Production Co. 1 Valiquette, Lot 1, Blk. 13, ACH & B Sur. 29, A-411. Dry. TD 10,200 ft.

Calhoun County: W. B. Trammell et al 1 Williams, Manuel Lopez Sur., A-25. IP 65.4 BOPD, 7/16-in., 41.7°, casing perforations 5,971-86 ft. TD 6,075 ft. (New field.)

Colorado County: Sinclair Oil & Gas Co. 1 Struss, Samuel Williams Sur., A-609. Dry. TD 3,498 ft.

Fort Bend County: Southern Minerals Corp. 1 McCrary et al, Knight and White Sur., A-46. Dry. TD 7,615 ft.

Goliad County: C. J. Brown 1 Victoria National Bank, Lot 4, N. G. Stebbins Sur., A-256. Dry. TD 9,321 ft.

Deep Rock Oil Corp. 1 Albrecht, A. Linville 1/3 Lge., A-184. Dry. TD 8,497 ft.

Harris County: Harry L. Edwards Drilling Co. 1 Schindewolf, Ambrose Mays Sur., A-543. Dry. TD 8,073 ft.

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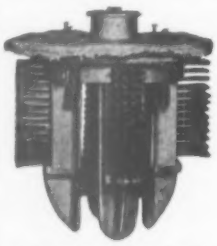

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WILDCAT COMPLETIONS

Oil Co. et al 1 Dopslauf field, WCRR Sur. 5, Blk. 1. Dry. TD 7,866 ft.

Rycade Oil Corp. and Commercial Petroleum & Transportation Co. 1 Jefferson, H&TC Sur. 46, Blk. 2, A-1323. Dry. TD 7,449 ft.

Jackson County: Texas Crude Oil Co. and Salt Dome Production Co. 1 Weeks, W. J. E. Heard Sur., A-31. Dry. TD 6,515 ft.

Karnes County: W. H. Spice, Jr. et al 1 Nichols, Seguin Grant, A-10. Dry. TD 4,521 ft.

Liberty County: General Crude Oil Co. 3 Morris et al, Peter Mason Sur., A-69. Shut down. TD 13,500 ft.

Live Oak County: Oil Corp. 1 McWhorter, G&BN Sur., A-210. Dry. TD 4,111 ft.

Matagorda County: Skelly Oil Co. 3 Savage, Maria Cummins Sur., A-22. Dry. TD 9,499 ft.

Montgomery County: D. D. Feldman Oil & Gas Co. and Moran Corp. 2 Teas, James Edwards Sur., A-190. Dry. TD 8,694 ft.

Newton County: Houston Oil Co. of Texas and American Republic Corp. 1 Brown, G. H. Bengen Sur. 8, A-49. Dry. TD 7,680 ft.

Orange County: John W. Mecom 1 Bailey, G. Stephenson Sur., A-167. Dry. TD 9,025 ft.

Refugio County: Dudley T. Dougherty 1 Vincent & Wilson, CEPI&M Sur. 74, A-123. Dry. TD 6,016 ft.

Victoria County: Arnold O. Morgan 1 Murphy-Haschke, Felipe Dimitt Sur., A-20. Dry. TD 9,065 ft.

Wharton County: Magnolia Petroleum Co. 1 Poole, GH&H Sur. 25, A-156. Dry. TD 10,500 ft.

EAST TEXAS

Camp County: Stephens & Peveto 1 Buster Smith, E. B. Davis Sur., A-35. Dry. TD 6,117 ft.

Ellis County: L. M. White 1 Brindley, A. Douglass Sur., A-308. Dry. TD 1,065 ft.

Fannin County: Burk Royalty Co. 1 Goss, D. J. Massengale Sur. Dry. TD 3,667 ft.

Harrison County: Trans-Tex Drilling Co. 1 Jackson, William Watkins Sur. Dry. TD 7,452 ft.

Henderson County: Delta Drilling Co. 1 Foster, J. S. Cordova Sur., 4 miles SW Tri-Cities field. IP 347 BOPD, 44°, ¼-in., perforated Bacon limestone (Rodessa), 7,510-20 ft. TD 8,483 ft.

Leon County: Carter-Gragg Oil Co. 1 Holly, Jose Maria Sanchez Sur., A-22. Dry. TD 6,149 ft.

Sabine County: Stephens & Phillips 1 Nethery, Josiah Evans Sur., A-96. Dry. TD 6,540 ft. Elev. 280 ft., Trinity 5,464 ft., upper Glen Rose 5,723 ft., Main reef 6,486 ft.

TEXAS PANHANDLE

Gray County: Gulf Oil Corp. 1 Shackelton, 67-3-I&GN, 2½ miles E. Pampa. Dry. TD 8,048 ft.

Roberts County: Shamrock Oil & Gas Corp. 1-A Beulah Edge, 203-M2-BS&F Sur. Dry. TD 4,161 ft.

WEST CENTRAL TEXAS

Brown County: Saddler Drilling Corp. 1 C. A. Burger, Sec. 13, HT&B Sur. Dry. TD 1,479 ft.

Callahan County: Bander & Couch 1 Fred Cutbirth, Bartola Garcia Sur. 204. Dry. TD 2,183 ft.

Hovgard & Fitzgerald 1 Morse, Sec. 138, GH&H Sur. Dry. TD 4,200 ft.

Ray Oil Co. 1 Barton, Sec. 528, Thomas Asher Sur. Dry. TD 1,975 ft.

Coleman County: James K. Anderson 1 Webb, Sec. 172, M. Izod Sur. IPP 26 BOPD, 40°, pay 2,474 ft. TD 2,500 ft.

Fisher County: General Crude Oil Co. 1 Cummings, 255-3-H&TC. Dry. TD 6,980 ft. Elev. 2,164 ft., Ellenburger 6,763 ft.

Haskell County: Thos. D. Humphrey & Sons 2 Gertrude Swain, H R. Craig Sur. 158. Dry. TD 5,380 ft.

Jones County: Jones & Stasney 1 Neidecken, 30-339-Austin & Williams Sur. Dry. TD 3,230 ft.

Lester & Duffield, Inc. and Billups 1 Lewis, 2-15-T&P. Dry. TD 2,266 ft.

Nolan County: Deep Rock Oil Corp. 1-A Georgia Tech, 89-24-T&P. Dry. TD 7,217 ft. Elev. 2,341 ft., Ellenburger 7,192 ft.

Roark, Hooker and A. G. Hill 1 Boyd, 61-21-T&P. Dry. TD 6,589 ft. Elev. 2,165 ft., Ellenburger 6,120 ft., pre-Cambrian 6,530 ft.

Shackelford County: Sojourner Drilling Co. 1 Hendrick, Sec. 128, ETRR Sur. Dry. TD 1,430 ft.

Stephens County: J. F. Connally 1 Elza Scarlett, 17-7-T&P. Dry. TD 4,012 ft.

Taylor County: Davidson & Fitzgerald 1 Atkins, W. Hefferman Sur. 1. Dry. TD 4,520 ft.

S. C. Herring 1 Guy Gannaway, J. M. Swisher Sur. 457. Dry. TD 4,552 ft.

Roark-Hooker-Roark 2 Lola O'Kelly, 22-19-T&P. IP 106 BOPD, ¼-in., Strawn pay 4,956 ft. TD 4,971 ft.

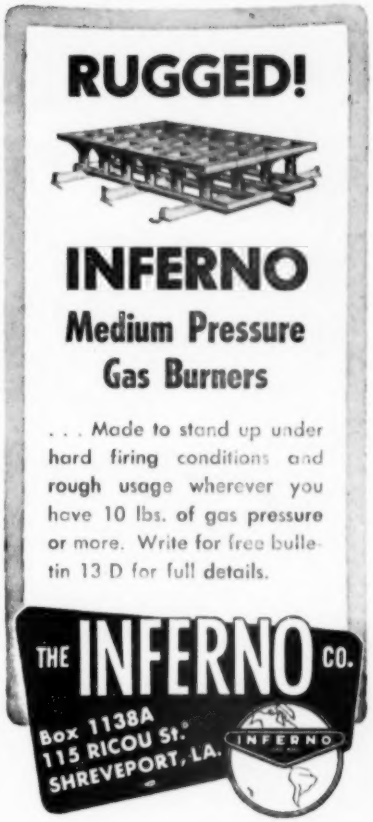
NORTH TEXAS

Archer County: Louis Egan 1 Justice, W. H. Patton Sur., A-345. Dry. TD 3,407 ft.

S. F. Hutcheson 4 Sallie Hutcheson, Blk. 142, J. Harris Subd. Dry. TD 1,416 ft.

Peterson and McCarty 1-BB Wilson, Sec. 2, H&TC. IPP 60 BOPD, 42°, conglomerate pay 4,949-59 ft. TD 5,098 ft.

Baylor County: J. W. Hastings 1 Fayette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UNIT RIG Draw Works are designed by field-experienced engineers. Every new model is thoroughly tested in actual drilling operations before it is offered for general sale. That's one of the many reasons why UNIT RIG equipment operates smoother, faster, and economically. Ask any engineer who has had experience with a UNIT RIG Draw Works and he'll tell you why UNIT RIG is your best draw works buy.

FOR DRILLING TO 12,000 FT. . . buy a U-20. Its low, compact design and maximum weight of less than 50,000 lbs., solves the portability problem. Addition of sand line drum can easily be made in the field without altering the main case. For complete information on the U-20 — write for catalog TODAY.

UNIT RIG & EQUIPMENT CO.
TULSA, OKLAHOMA U.S.A.

• DESIGNED FOR THE JOB.

U-34 U-35 U-15 U-40 U-20 U-30

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Lucey Products Corporation
Oil Well Supply Division, United States Steel Corp.
And Other Leading Supply Stores

Export Sales—Mid-Continent Supply Company, 42 Broadway, New York City. Cable—Midunitrig

WILDCAT COMPLETIONS

County, Fayette CSL, A-148. Dry. TD 5,479 ft.

Clay County: Consolidated Oil Co. 1-C Alcorn, Ambrose Crain Sur., A-83. Dry. TD 6,552 ft.

Needl & Hood Drilling Co. 1 Cozart, Sec. 3261, TE&L Sur. Dry. TD 4,203 ft.

Cooke County: J. R. and Adam Seitz 1 Turner, C. Wiggins Sur., A-1135. Dry. TD 4,287 ft.

Grayson County: Pontiac Drilling Co. 1 Medford, James Chaffin Sur., A-250. Dry. TD 5,505 ft.

Jack County: L. T. and Bobby Burns 1 Garner Bros., H&GN Sur., A-302. IPP 81 BOPD, 41°, Strawn 3,866-77 ft. TD 3,892 ft.

Warren Petroleum Corp. 1 Thomas Cherryhomes, H&GN Sur., A-296. Dry. TD 3,404 ft.

John T. Wilson 1 Johnson, E. Smith Sur., A-524. Dry. TD 3,770 ft.

Knox County: American Drilling Corp. 1 Ben Hunt, Blk. 9, E. W. Hunt Subd. Dry. TD 4,610 ft.

Montague County: Aires Oil Co. 1 J. L. Caswell, Blk. 54, Titus CSL. IP 500 BOPD, 8/64-in., 40°, Caddo perforations 6,074-6,104 ft. TD 6,113 ft. 3 miles S Richardson-Caddo field.

Arnold H. Bruner 1 Arami, F. J. Gibbons Sur., A-307. Dry. TD 6,494 ft.

Theo. Hamm Brewing Co. 1 Mrs. O. Davis, Sec. 41, ETRR Sur. IP 123 BOPD, 24/64-in., 36°, conglomerate perforations 5,936-42 ft. TD 5,970 ft. 1 mile SE Newport—Strawn field.

Young County: Ada Oil Co. 1 Minnie Wall, E. E. Cox Sur., A-1920. Dry. TD 3,698 ft.

Larson & Thomas 1-C Hall, D. Akin Sur., A-2238. IP 609 BOPD, 20/64-in., 33°, conglomerate pay 4,183 ft. TD 4,203 ft.

Frank Love & Co. 1 Caudill, Pedro Quero Sur., A-238. Dry. TD 3,304 ft.

WEST TEXAS

Andrews County: Skelly Oil Co. 1-L Texas, 11-9-University Lands. IP 298 BOPD, 30/64-in., 40°, Wolfcamp pay 8,418 ft. TD 8,493 ft. NW extension to Atlantic 1-A University, Wolfcamp discovery.

Crockett County: Humble Oil & Refining Co. 1-V State-University, 10-31-University Lands. Dry. TD 9,705 ft. Elev. 2,606 ft., Strawn 8,210 ft., Simpson 8,650 ft., Ellenburger 8,970 ft.

Dawson County: H. L. Hunt 1 Nix, 41-33-T5N-T&P. Dry. TD 8,476 ft. Elev. 2,878 ft., Spraberry 6,510 ft.

Garza County: Harry Hubbard 1 Shelby CSL, Shelby CSL Sur., A-397. Dry. TD 4,017 ft.

Howard County: Fullerton Oil Co. 1 Anderson, 9-31-T2N-T&P. Dry. TD 7,750 ft.

Loving County: Lawless Drilling Co. 1 Minnie Kyle, 14-55-T1S-T&P. Dry. TD 4,378 ft. Elev. 3,054 ft., Delaware sand 4,069 ft.

Pecos County: Tiger Minerals, Inc. 2 Wilson, 17-145-T&STL Sur. Dry. TD 1,700 ft.

Runnels County: Sid Katz Exploration Co. 1 Miller, James Carothers Sur. 235. Dry. TD 4,163 ft. Elev. 1,741 ft., Caddo 4,122 ft.

West Central Drilling Co. 1 Walter Jacob, J. C. McKean Sur. 534. Dry. TD 4,437 ft. Elev. 1,762 ft., Ellenburger 4,436 ft.

Schleicher County: American Republics Corp. 1 S. M. Thompson Unit 1, 80-M-GH&SA, W. W. Childress A-822. IPP 285 BOPD, 16/64-in., 43°, reef pay 5,492 ft. TD 5,591 ft.

Sutton County: Sheardy A. Lamb 2 Mrs. W. Faulkner, 79-A-GW&T Sur. Dry. TD 3,038 ft. Elev. 2,069 ft., Strawn 2,678 ft.

Southwest National Production Co. 1 Joe Ross, 14-14-TW&GN. Dry. TD 5,786 ft. Elev. 2,313 ft. estimated, Ellenburger 5,400 ft.

Terry County: DeKalb Agricultural Association 1 Kennedy, 25-DD-J. H. Gibson Sur. Dry. TD 225 ft.

DeKalb 1 Lasiter, 2-DD-J. H. Gibson Sur. Dry. TD 110 ft.

Delfern Oil Co. 1 Minton, 23-DD-J. H. Gibson Sur. Dry. TD 240 ft.

Tom Green County: Conkling Bros. 1 Holik, 165-11-SPRR. Dry. TD 4,700 ft. Elev. 1,989 ft., Strawn 4,672 ft.

Republic Natural Gas Co. 1 Hair, Sec. 1, HT&B Sur., 3½ miles SE San Angelo. IP 352 BOPD, ½-in., 32°, Pennsylvanian (?) pay 3,300 ft. TD 6,200 ft.

Ward County: Bradford Drilling Co. 1 McDaniel, 6-5-H&TC. IPP 14 BOPD, 35°, pay 2,564 ft. TD 2,576 ft.

W. P. Luse and C. O. Ice 1 Dorr, 2-32-H&TC. Dry. TD 2,494 ft.

Yoakum County: British American Oil Producing Co. 1 Brownfield, 563-D-J. H. Gibson Sur. Dry. TD 8,750 ft.

SOUTHEAST NEW MEXICO

Lea County: Gulf Oil Corp. 2 Lillie, 23-24s-37e. IPP 557 BOPD, 40°, pay 6,210 ft. TD 8,391 ft., PB 6,285 ft. New pay on flank of Fowler-Ellenburger area.

Socorro County: J. R. Lockhart 1 J. R. Lockhart-Federal, 28-4s-6e. Dry. TD 2,990 ft. Elev. 5,752 ft., Abo 738 ft., Pennsylvanian 1,580 ft., pre-Cambrian 2,988 ft.

ILLINOIS

Bond County: C. R. Hoiles 1 Hoffman, NE SE SW 22-5n-3w. Dry. TD 1,070 ft.

Champaign County: C. Bates 1 Coles, SE

AVOID COSTLY SHUT-DOWNS!

DISTINCTIVE ADVANTAGES of THOMAS ALL-METAL COUPLINGS	
FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.

Specify THOMAS Flexible Couplings for Power Transmission

REFINERS! PIPE LINE MEN! DRILLING ENGINEERS! LABORATORY TECHNICIANS!

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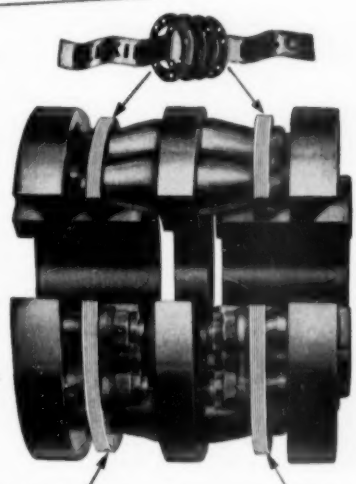
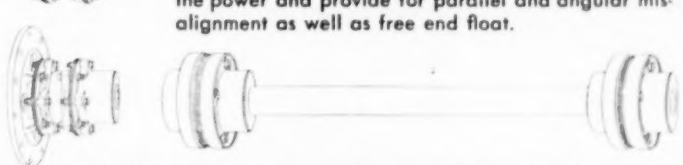


Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.



Write for our new Engineering Catalog No. 51

THOMAS FLEXIBLE COUPLING COMPANY

WARREN, PENNSYLVANIA, U.S.A.

WILDCAT COMPLETIONS

NE SE 36-18n-8e. Dry. TD 2,800 ft.
Christian County: A. C. Otto 1 Tontiersky, SW SE NE 13-15n-2w. Dry. TD 1,886 ft.
Clay County: Carter Oil Co. 1 Markham, NE NW SE 17-2n-6e. Dry. TD 3,206 ft.
Edgar County: E. C. Myers 1 Jared, SW NE SE 19-14n-13w. Dry. TD 363 ft.
Effingham County: W. C. McBride 1 Krohn, NW NW NW 11-6n-6e. Dry. TD 2,543 ft.
Madison County: George Casseus 1 Brandt, NE NW SE 29-6n-6w. Dry. TD 544 ft.

INDIANA

Putnam County: Raja Oil Co. 1 Lane, SE SE NE 14-15n-4w. Dry. TD 1,054 ft.
Sullivan County: Great Lakes Carbon Co. 1 Hollenbeck, SW NW NE 2-9n-11w. Dry. TD 1,520 ft.
H. A. Johnson 2 Riggs, NE NE NW 1-7n-11w. Dry. TD 921 ft.
Vigo County: Phillips Oil Co. 1 Hunt, SW SE SW 34-10n-10w. Dry. TD 2,457 ft.

KENTUCKY

Christian County: G. A. Hoffman et al. 1 Robinson, NE SE NW 1-G-23. Dry. TD 1,549 ft.
Henderson County: George S. Engle 1 Dempewolf, NW NW SE 14-Q-26. Dry. TD 2,233 ft.
Muhlenberg County: C. R. Craft 1 Cisney, NE NW SW 25-H-30. Dry. TD 2,590 ft.
Ohio County: H. E. Beane 1 Leach, SE SE NE 22-E-33. Dry. TD 1,418 ft.

MICHIGAN

Allegan County: Cook Drilling Co. 1 Bigoszewski, SE NE NW 6-1n-14w. Dry. TD 1,359 ft. in Traverse lime.
Allegan County: E. Edwin Brehm 1 Boerman, NW NW NW 15-1n-14w. Dry. TD 1,391 ft. in Traverse lime.
Arenac County: C. W. Collin 1 Stoyak, SW SE SW 15-20n-3e. Dry. TD 3,105 ft. in Dundee.
Arenac County: Frank E. Roush 1 Vallad, NE NE SW 24-18n-4e. Dry. TD 2,900 ft. in Dundee.
Isabella County: Socony-Vacuum Oil Co., Inc. 1 Gifford, NE SW NW 33-13n-5w. Dry. TD 3,619 ft. in Dundee.
Manistee County: Taggart Bros. Gas Co. 1 Walkley, SE SE SE 14-22n-14w. Dry. TD 6,055 ft. in Niagaran.
Muskegon County: R. W. Devine & J. W. Lang Co. 1 La Belle, NE NW NW 24-9n-15w. Dry. TD 1,939 ft. in Traverse lime.
Saginaw County: Michigan Oil Co. 1 Zeitler, NW NE NW 22-12n-1e. Dry. TD 3,367 ft. in Dundee.
Sanilac County: Deep Test Drilling Co. 1 Csizmadia Jr., E½ NW NE 5-11n-15e. Dry. TD 2,242 ft. in Detroit River.

OHIO

Lake County: Morton Salt Co. 1 New York Central R. R. Co. Lot 24, Painesville Township. IP 4,100 M.c.f. daily, Austinburg 1,535 -?, TD 1,538 ft.—new pool.

ALABAMA

Baldwin County: Sunnyland Contracting Co. 1 Earle et al, C NE SW 7-3n-4e. Dry. TD 6,360 ft. Elev. 168 ft., Wilcox 1,246 ft., marine Tuscaloosa 5,494 ft., lower Tuscaloosa 5,746 ft., Massive 5,897 ft.
Crenshaw County: J. A. Harper 1 Copeland, C SW NW 30-8n-19e. Dry. TD 3,805 ft.
Escambia County: Gulf Refining Co. 3 First National Bank of Mobile, C SE SW 9-2n-8e. Dry. TD 6,120 ft. Elev. 264 ft., marine Tuscaloosa 5,503 ft., lower Tuscaloosa 5,676 ft., Massive 5,830 ft., lower Cretaceous 6,087 ft.

MISSISSIPPI

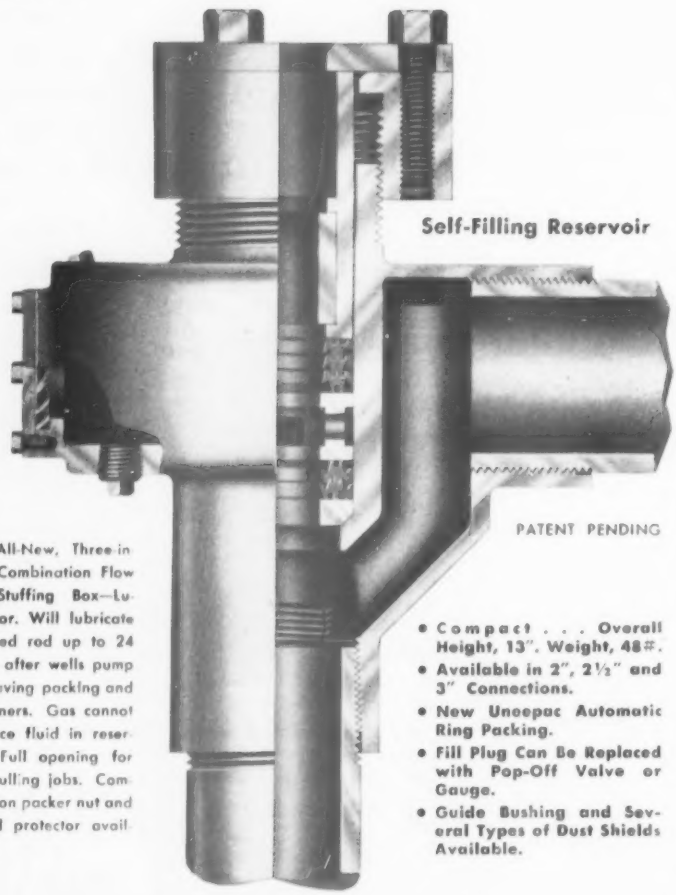
Adams County: H. L. Rowley and D. A. Biglane 1 Armstrong, 11-5n-2w. Dry. TD 6,822 ft. Elev. 93 ft., Wilcox 2,157 ft., base Baker shale 6,442 ft., Walker zone 6,680 ft.
Stone County: Lion Oil Co. 1 Dantzler, 22-3s-13w. Dry. TD 8,939 ft. Elev. 249 ft., Wilcox 3,069 ft., marine Tuscaloosa 7,691 ft., lower Tuscaloosa 8,213 ft., Massive 8,488 ft., lower Cretaceous 8,928 ft.
Wayne County: Lyle Cashion Co. and D. Gammill 1 Gandy et al, 28-10n-6w. Dry. TD 4,814 ft. Elev. 335 ft., Eutaw 4,385 ft., Stanley zone 4,561 ft.
Wilkinson County: Gulf Refining Co. 40 Crosby, 9-2n-1e. Dry. TD 8,023 ft. Elev. 348 ft. Wilcox 5,703 ft., base Baker shale 7,548 ft.

SOUTH LOUISIANA

Cameron Parish: The Texas Co. and A. C. Glassell, Jr. 6 Comegys, 18-13s-3w. IP 120 BOPD, 8/64-in., 32.1°, casing perforations 6,128-34 ft. TD 6,296 ft. (New pay in Grand Lake field.)
Plaquemines Parish: Kerr-McGee Oil Industries, Inc., 1-A State Lease 1998, Blk. 21, Breton Sound. IP 240 BOPD, 10/64-in., 28.3°, casing perforations 6,063-66 ft. TD 7,000 ft. (New field.)
St. Landry Parish: Sohio Petroleum Co. and Gulf Refining Co. 1 Parker, 72-4s-4e. IP 189 BOPD, 10/64-in., 49.6°, Sparta 10,147-52 ft. (casing perforations). TD 12,320 ft. (New field.)
Sinclair Oil & Gas Co. and Atlantic Refining Co. 1 Brewer-Nienstedt, 21-4s-6e. IP 282 BCPD, 11/64-in., 53.4°, casing

MW

POLISHED ROD LUBRICATOR AND STUFFING BOX TYPE "B"



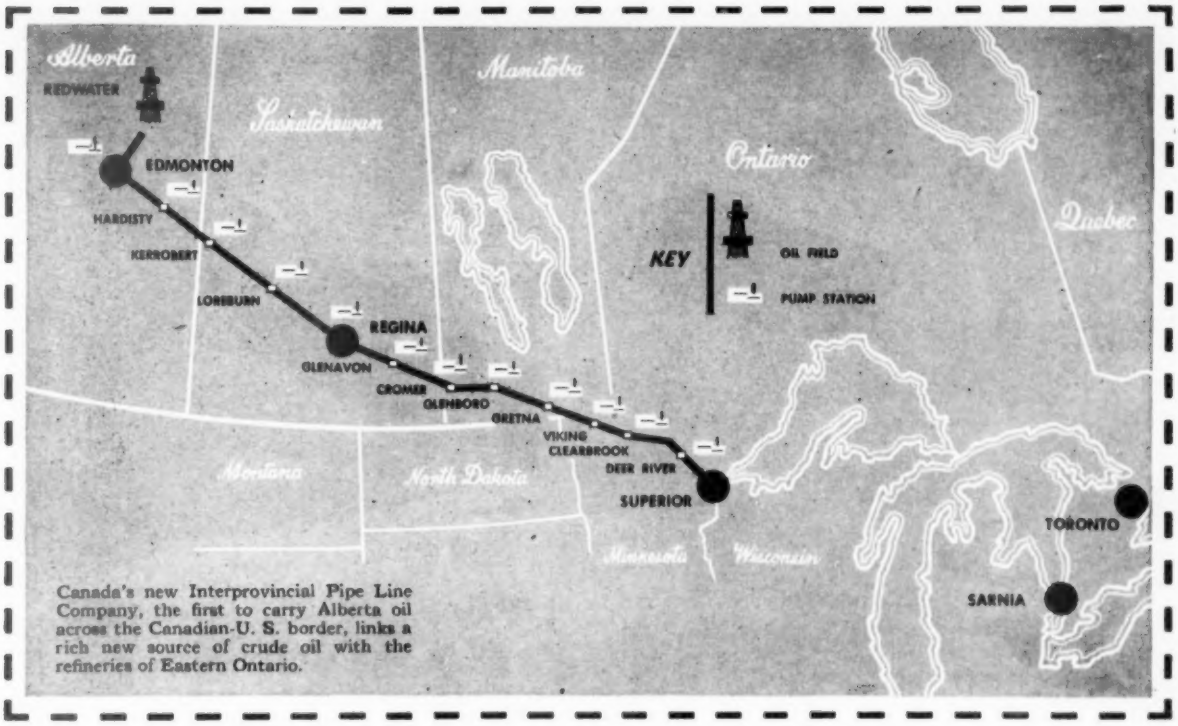
PATENT PENDING

The All-New, Three-in-One Combination Flow Tee—Stuffing Box—Lubricator. Will lubricate polished rod up to 24 hours after wells pump off, saving packing and rod liners. Gas cannot displace fluid in reservoir. Full opening for rod pulling jobs. Combination packer nut and thread protector available.

- Compact . . . Overall Height, 13". Weight, 48#.
- Available in 2", 2½" and 3" Connections.
- New Uneepac Automatic Ring Packing.
- Fill Plug Can Be Replaced with Pop-Off Valve or Gauge.
- Guide Bushing and Several Types of Dust Shields Available.

Available Through Major Supply Stores

MUSKOGEE IRON WORKS, INC.
MUSKOGEE, OKLAHOMA



Canada's new Interprovincial Pipe Line Company, the first to carry Alberta oil across the Canadian-U. S. border, links a rich new source of crude oil with the refineries of Eastern Ontario.

Alco Diesel Engines Pump Alberta Oil 1137 miles to U.S. Port on Great Lakes

Canada's new 1137-mile Interprovincial Pipe Line and its American Subsidiary, Lakehead Pipe Line Company, Inc., offer an outstanding example of international teamwork—and open a new era in the history of Canadian petroleum.

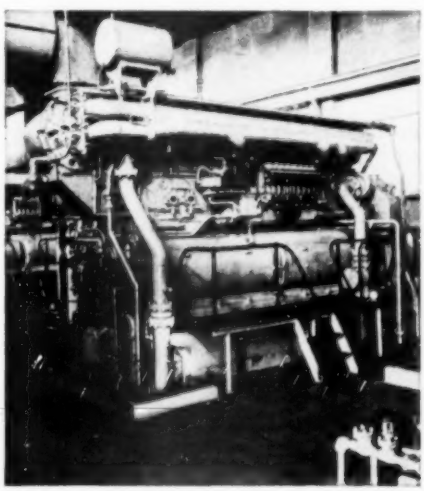
Served by Alco Diesel Engines, this first major Canadian pipeline (approximate annual capacity: 58.5 million barrels out of Edmonton) carries crude oil from the rich fields of central Alberta to the strategically located Great Lakes port of Superior, Wisconsin, from where it is transported to the refineries of Eastern Ontario.

Nine of the line's twelve pumping stations are located in Canada, three in the U. S. (see map). Each is powered by either two, three or four Alco Diesel Engines. Units for the Canadian stations were built under Alco license by the Dominion Engineering Works of Montreal; U. S. units were built in Alco's diesel plant at Auburn, N. Y.

Some of these 12½ in. x 13 in. engines have six cylinders and others, eight. Some are straight diesel and others are dual fuel. All of the engines are suitable for burning available crude oil.

The new Interprovincial Pipe Line is just one more major installation where the compactness, efficiency and flexibility of Alco Diesel Engines are helping to meet the free world's growing demand for petroleum products.

Your nearest Alco sales representative will be happy to give you detailed information on Alco Diesel Engines. Contact him at New York, Beaumont, Chicago, Cleveland, Houston, Kansas City, San Francisco, Schenectady or St. Louis.



Eight cylinder, 12½ in. x 13 in. Alco dual-fuel Diesel Engine, manufactured in Canada by Dominion Engineering Works, Montreal, shown in engine room of the Interprovincial's Edmonton, Alberta, pumping station.

ALCO DIESELS

AMERICAN LOCOMOTIVE COMPANY
SCHENECTADY, N. Y.

The mark of modern engineering

Fractions
SOLVE BIG PROBLEMS

The petroleum industry has made good use of the "divide-and-rule" formula that conquered kingdoms . . . to win command of the giant powers hidden in nature's oil. The industry's process engineers have transformed American life by their mastery of petroleum's secrets . . . and fractionating has been their master key.

These engineers' ability to develop processes which break petroleum into its component fractions has harnessed the "black gold" into a myriad forms of service. There have been other important results, too. The gigantic motor industry . . . America's vast network of modern highways . . . the services to motor travel—these are largely by-products of the petroleum process engineer's knowledge of fractional distillation.

For many years, Sun Ship has been adding to its own prestige by the service and cooperation its great shops give to the petroleum industry, and to the many other industries which call on Sun Ship's versatile engineering and construction skills. It has built . . . for chemical and petroleum process engineers, and for refineries throughout the world . . . the immense fractionating towers, pressure vessels, special machinery and heavy equipment they require. The 95'7" crude tower shown in the photograph, ready for shipment, is a representative example.

Sun Ship's services will continue to keep pace with the giant strides made by the nation's industries in the engineering progress which is steadily building a greater America

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ON THE DELAWARE (SINCE 1916) CHESTER, PA.

25 BROADWAY • NEW YORK CITY

WILDCAT COMPLETIONS

perforations 11,111-17 ft. TD 11,641 ft. (New field.)

St. Mary Parish: Fidelity Oil & Royalty Co. 1 Shannon unit, 15-15s-10e. Dry. TD 12,400 ft.

NORTH LOUISIANA

Bienville Parish: Bagley Drilling Co. and C. O. Day 2 Lacy, 2,310 ft. S and 940 ft. W of NEc 14-14n-8w. Dry. TD 3,505 ft.

Concordia Parish: H. L. Hunt and Gulf Refining Co. 21 Fisher Lumber Co. "E," C NE SW 12-7n-7e. Dry. TD 5,970 ft.

Grant Parish: E. L. Wilkens et al 1 Urania Lumber Co., C NE NE 8-7n-1e. Dry. TD 5,010 ft.

Sabine Parish: P&F Drilling Co. 1 Whitney Corp., C SE SE NE 3-9n-14w. Dry. TD 3,179 ft.

ARKANSAS

White County: Robert A. Vogt 1 Shaffer, near NWc NE NE 13-6n-5w. Dry. TD 1,125 ft.

Woodruff County: Magnolia Petroleum Co. 18 core test, near 18-7n-1w. Dry. TD 1,887 ft.

Magnolia 19 core test, 16-8n-3w. Dry. TD 1,887 ft.

OKLAHOMA

Caddo County: Huffman & Malloy 1 Oswald, SW NW NW 16-6n-12w. Dry. TD 2,504 ft.

Cimarron County: Colorado Interstate 1 Burford, NW NW SE 29-5n-8eCM. IP 45,000 M.c.f. of gas per day, Keyes sand 4,763-82 ft. TD 4,872 ft. (Gas discovery.)

Shamrock 1 Mathis-Davis, NW NW SE 21-6n-8eCM. Dry. TD 4,762 ft.

Cleveland County: Ashland Oil & Refining Co. 1 Nance, SW NE NW 19-7n-1e. IPF 205 BOPD, Bromide sand 6,989-91 ft., 36°, ¼-in. TD 7,790 ft. (Oil discovery.)

Lincoln County: Anderson-Prichard Oil Corp. 1 Marshall, NE NE SE 14-13n-5e. Dry. TD 3,735 ft.

N. V. Duncan 1 Deatherage Estate, SW SW SW 13-14n-2e. IPF 2,850 M.c.f. of gas per day, Checkerboard 3,627-34 ft. (Gas discovery) TD 5,260 ft.

Fred P. Schonwald 1 Woodard, NE NE SW 15-16n-5e. Dry. TD 3,945 ft.

Logan County: J. G. Catlett 1 Heller, SW SE SW 31-15n-1e. Dry. TD 5,898 ft.

McClain County: Skelly Oil Co. 1 Foster, SW NW 20-5n-2w. Dry. TD 8,511 ft.

Osage County: Sunray Oil Corp. 1 Osage, NE NE SE 20-26n-4e. Dry. TD 3,420 ft.

Stephens County: J. A. Maurer 1 Earl, NW SW SE 24-1n-6w. Dry. TD 7,519 ft.

KANSAS

Barber County: K&E Drilling Co. 1 Grigsby, SE SE NW 15-30s-13w. Dry. TD 4,697 ft.

Barton County: Shelly Miller 1 Strank, SW SW SW 20-18s-11w. Dry. TD 3,460 ft.

Petroleum, Inc. 1 Zimmer "A," SW NE NW 20-19s-14w. Dry. TD 3,570 ft.

Chase County: Rex & Morris 1 Olson, NW NE NE 21-20s-6e. Dry. TD 2,630 ft.

Cowley County: J. G. Ripstra 1 Avers, NE NW SE 4-32s-6e. Dry. TD 3,116 ft.

Graham County: Musgrove and C&G Drilling Co. 1 Bundy, NW NW SW 12-9s-22w. Dry. TD 3,945 ft.

Gray County: Deep Rock Oil Corp. 1 Schartz, C NW NE 33-24s-28w. Dry. TD 5,150 ft. Miss. 4,847 ft.

Hamilton County: J. S. Woodward 1 Buck, SE SE NW 15-23s-39w. Dry. TD 5,333 ft. Miss. 5,205 ft.

Harper County: Beardmore Drilling Co. 1 Oliver, NE NE NW 2-32s-6w. Dry. TD 4,885 ft.

Marion County: Geo. Marilatt et al 1 Schneider, NE NE NW 8-17s-4e. Dry. TD 2,389 ft.

Pawnee County: Tom Allen 1 McDonnel, NW NW SE 1-22s-15w. Dry. TD 3,937 ft.

Pratt County: Lohman & Johnson 1 Thompson, SE SE SE 24-28s-14w. Dry. TD 4,670 ft.

Stafford County: NCRA 1 Slade, SW SE SW 23-25s-12w. IPF 108 BOPD, Lansing Kansas City, 3,819-24 ft. TD 4,218 ft. (Opens Slade pool.)

Trego County: Braden Drilling Co. 1 Lecuyer "A," SE SE NW 11-15s-22w. Dry. TD 4,417 ft.

NEBRASKA

Cheyenne County: Chicago Corp. & Republic Natural Gas and Rogers 1-A Overholt, SE SE SE 21-14n-50w. Dry. TD 4,830 ft. "J" sand 4,810 ft.

Plains Exploration and Dunn & Boreing 1 Schoen, NW SE SE 9-15n-49w. Dry. TD 4,675 ft. "J" sand 4,608 ft.

Dawes County: Gulf Oil Corp. 1 Jones, SW SW NW 3-29n-52w. Dry. TD 4,390 ft. Spearfish 4,349 ft.

NORTH DAKOTA

Bottineau County: Zach Brooks 1 Andre Nelsen, NE SE 21-163n-80w. Dry. TD 3,725 ft. Mission Canyon 3,564 ft.

CALIFORNIA

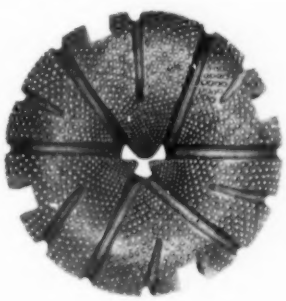
Kern County: Edward Nepple 1 U. S., 10-26s-28e. Dry. TD 1,196 ft.

R. S. Rheem, Opr. 1 Davis, 3-28s-27e. Dry. TD 6,142 ft.

Universal Consolidated Oil Co. 18-21 Conoco, 21-25s-20e. Dry. TD 4,405 ft.

(Continued on page 222)

the answer
to many of your
drilling problems



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TRUCO DIAMOND BITS
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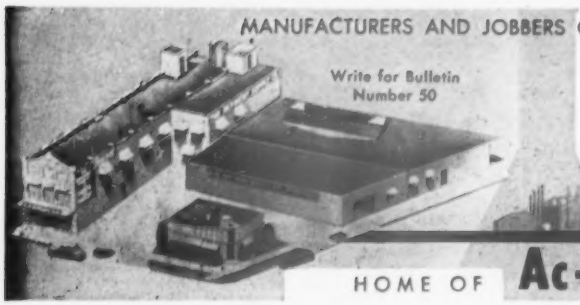
THE OIL AND GAS JOURNAL

"I'm anxious to see how you handle this situation—I've had it for years at the office."



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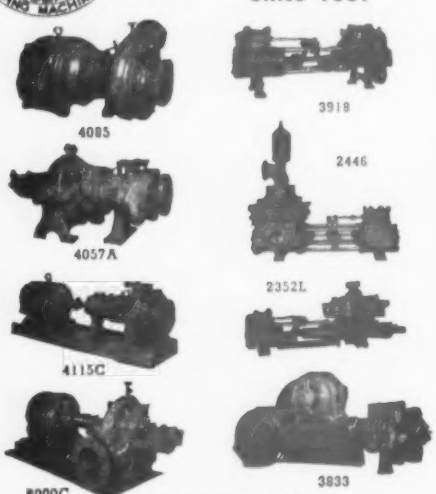

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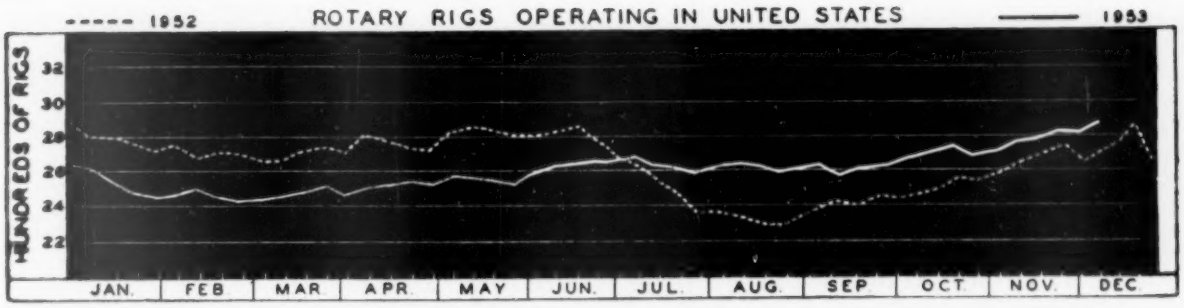
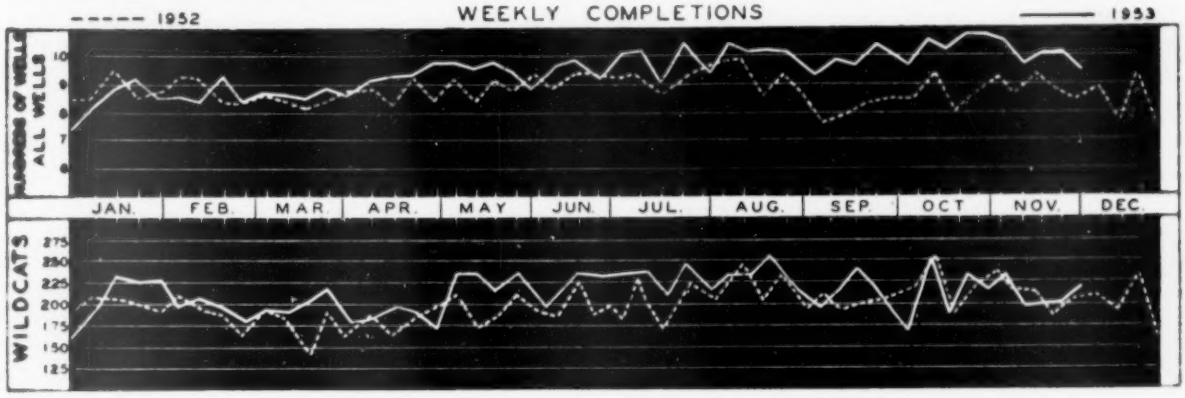




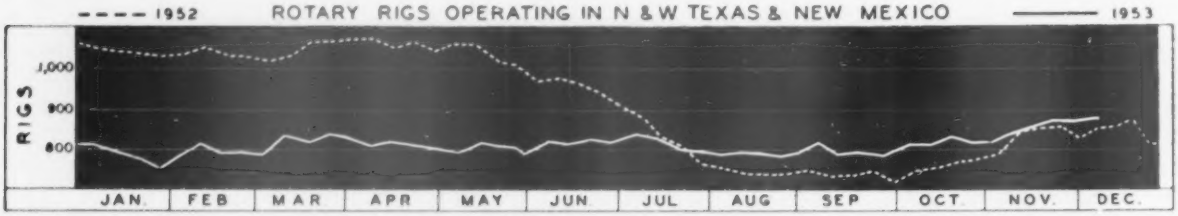
CURRENT STATISTICS

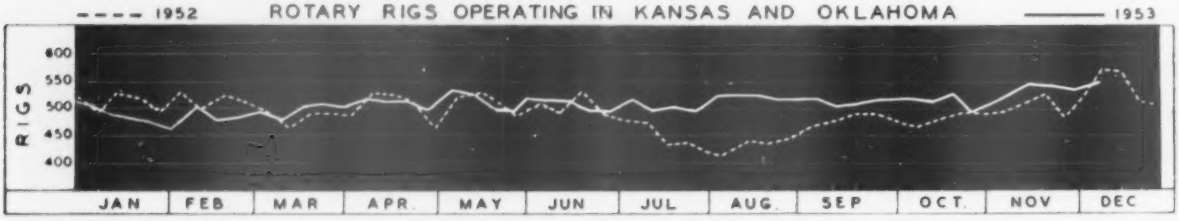
EXPLORATION

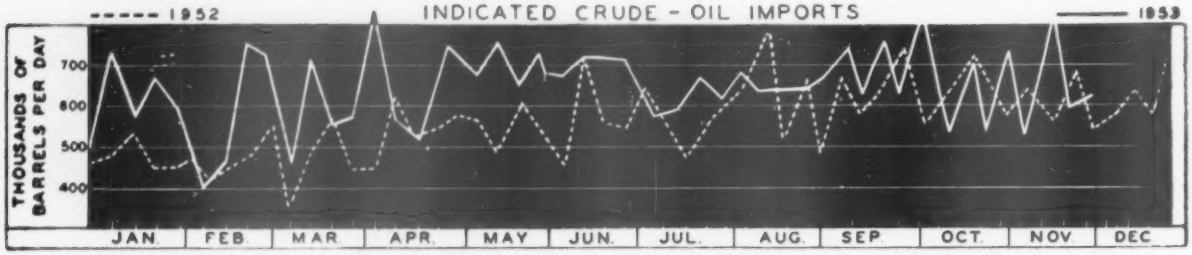
WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 5, 1953

	Total of all wells					Dec. 5		Wildcat completions and discoveries					Cumulative total, 1953				
	Comp.	Oil	Gas	Dry	Footage	1953	1952	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	14	7	0	*7	22,550	707	722	0	0	0	0	0	0	0	0	0	0
Pennsylvania	39	19	5	†15	86,378	1,785	1,790	0	0	0	0	0	0	0	3	14	17
West Virginia	4	0	3	1	14,329	574	556	0	0	0	0	0	0	0	11	9	20
Ohio	15	6	3	26	29,994	989	994	0	0	1	0	1	2	0	5	14	21
Indiana	25	7	0	18	37,017	1,237	1,194	0	0	0	4	4	13	0	2	333	348
Kentucky	27	7	4	16	50,159	1,094	1,233	0	0	0	5	5	12	0	1	183	196
Illinois	57	33	0	24	140,962	2,001	2,016	0	0	0	7	7	5	0	0	389	394
Michigan	14	5	0	9	35,691	585	654	0	0	0	9	9	17	0	5	242	264
Kansas	60	24	3	33	207,694	4,442	4,229	1	0	0	13	14	86	0	35	702	823
Nebraska	8	2	2	4	42,884	294	267	0	0	0	3	3	16	0	5	123	144
Oklahoma	124	73	7	§44	390,479	6,937	5,409	1	0	2	8	11	109	6	34	553	702
Texas	340	167	11	162	1,526,982	15,881	16,034	13	0	0	91	104	792	58	157	3,909	4,916
North Central (Dist. 7-B & 9)	116	52	1	63	382,442	6,001	5,248	7	0	0	27	34	412	0	17	1,549	1,978
West (Dist. 7-C & 8)	89	62	0	27	433,770	3,472	4,748	4	0	0	16	20	168	2	13	636	819
Panhandle (Dist. 10)	22	12	5	5	75,169	709	591	0	0	0	2	2	0	2	0	20	22
Eastern (Dist. 5 & 6)	13	5	1	7	61,747	743	741	1	0	0	6	7	22	2	5	248	277
Gulf Coast (Dist. 2 & 3)	59	23	3	33	383,681	2,332	2,449	1	0	0	22	23	93	25	65	636	819
Southwest (Dist. 1 & 4)	41	13	1	27	190,173	2,624	2,257	0	0	0	18	18	97	27	57	820	1,001
Louisiana	65	44	6	15	399,562	2,605	2,200	3	2	0	5	10	79	35	20	341	475
Northern	31	21	2	8	96,269	1,167	1,195	0	0	0	4	4	11	2	2	148	163
Southern	34	23	4	7	303,293	1,438	1,005	3	2	0	1	6	68	33	18	193	312
Arkansas	17	8	0	9	57,593	526	384	0	0	0	3	3	12	0	0	121	133
Mississippi	9	1	0	8	63,046	371	324	0	0	0	4	4	20	1	5	162	188
Southeastern States	4	1	0	3	19,963	138	73	0	0	0	3	3	1	0	0	112	113
Montana	12	3	1	8	39,077	413	310	0	0	0	5	5	12	0	0	109	121
Wyoming	34	20	0	14	184,975	790	636	1	0	0	11	12	25	0	3	135	163
Colorado	23	5	0	18	132,553	672	435	1	0	0	13	14	29	0	12	292	333
Utah	0	0	0	0	0	64	79	0	0	0	0	0	3	0	4	34	41
New Mexico	17	5	9	3	77,186	1,322	968	1	0	0	1	2	25	1	17	121	164
California	39	28	1	10	153,426	2,380	2,256	1	0	0	9	10	63	0	12	525	600
North Dakota	1	0	0	1	3,725	244	105	0	0	0	1	1	9	0	1	71	81
Miscellaneous	0	0	0	0	0	72	125	0	0	0	0	0	1	0	4	44	49
Total United States	948	465	55	428	3,716,225	46,123	42,993	22	2	3	195	222	1,331	101	336	8,538	10,306
Total previous week	1,008	593	69	346	3,959,773			28	1	8	167	204	1,309	99	333	8,343	10,084
Total December 6, 1952	891	438	62	391	3,797,334			19	1	6	182	208	1,282	77	236	8,146	9,735

Service wells included: *7, †12, ‡2, §3.



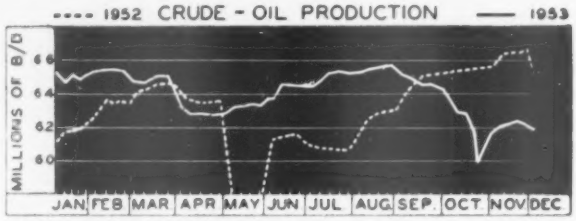


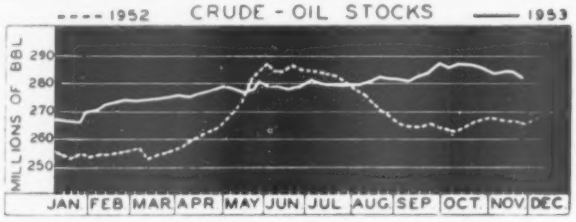


DAILY AVERAGE PRODUCTION FOR WEEK

	December 5			Nov. 28
	Crude oil	Lease condensate	Total	total
Alabama	4,500		4,500	4,600
Arkansas	79,850	700	80,550	81,450
California	1,009,500		1,009,500	999,600
Colorado	107,500		107,500	106,900
Eastern	59,500		59,500	59,500
Florida	1,475		1,475	1,500
Illinois	168,500		168,500	167,300
Indiana	33,800		33,800	33,800
Kansas	255,300		255,300	286,300
Kentucky	32,100		32,100	32,700
Louisiana	634,175	40,600	674,775	683,900
North	107,250	3,600	110,850	108,400
South	526,925	37,000	563,925	575,500
Michigan	32,800		32,800	33,100
Mississippi	91,800	3,200	95,000	95,050
Montana	32,700		32,700	32,800
Nebraska	13,900		13,900	13,200
New Mexico	196,150	900	197,050	205,750
Oklahoma	527,300		527,300	529,400
Texas	2,563,400	48,175	2,611,575	2,619,925
Dist. 1	38,500	425	38,925	38,700
Dist. 2	135,575	6,225	141,800	143,075
Dist. 3	413,950	23,650	437,600	442,000
Dist. 4	240,025	6,050	246,075	247,250
Dist. 5	44,600	450	45,050	45,650
Dist. 6	114,425	5,200	119,625	120,350
East Texas field	233,350		233,350	239,000
Dist. 7-B	119,775	50	119,825	118,050
Dist. 7-C	155,100	4,425	159,525	159,650
Dist. 8	807,775	1,400	809,175	804,875
Dist. 9	183,100	250	183,350	184,775
Dist. 10	77,225	50	77,275	76,550
Utah	4,700		4,700	4,800
Wyoming	241,500		241,500	221,300
North Dakota	14,600		14,600	14,300
Total U. S.	6,105,050	93,575	6,198,625	6,227,175
Change from previous week, down			28,550	
Canada	228,550		228,550	266,025
Total U. S. production January 1-December 5			2,190,893,900 bbl.	
Same period last year (crude plus cond.)			*2,119,106,100 bbl.	

*Includes 28,524,335 bbl. condensate.



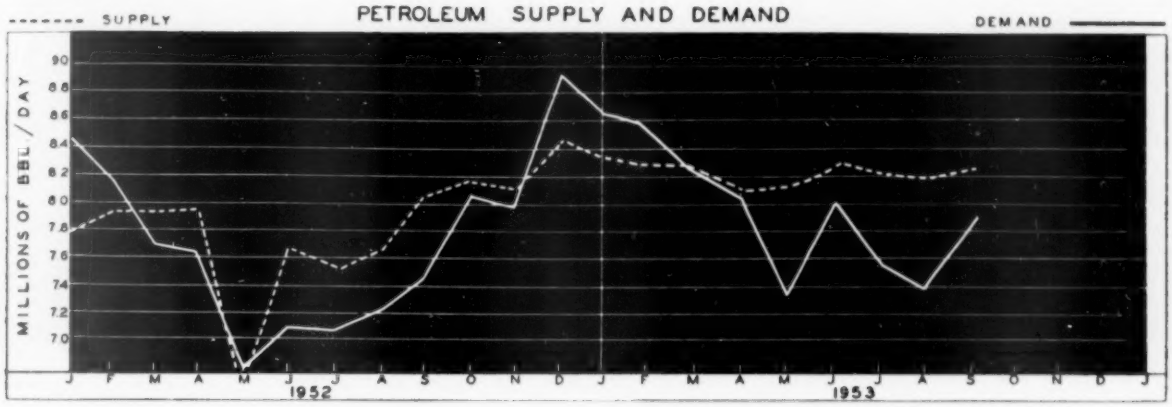


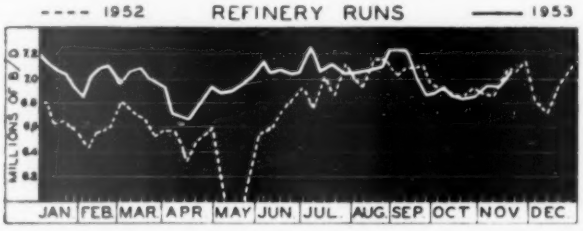
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

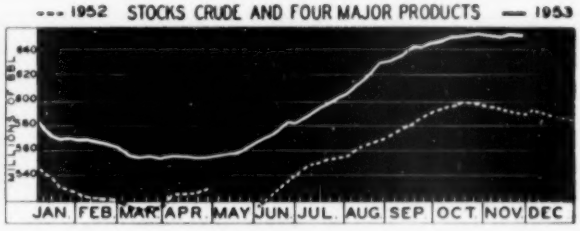
(Thousands of barrels)

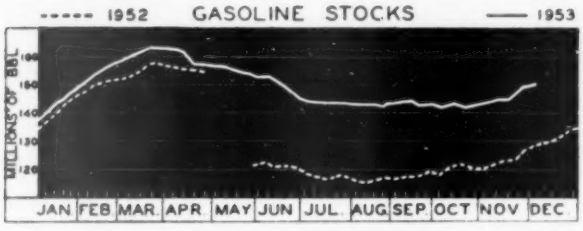
	Nov. 28, '53	Nov. 21, '53	Nov. 29, '52
Pennsylvania Grade	2,746	2,803	2,219
Other Appalachian	1,800	1,828	1,844
Illinois, Indiana, Michigan	12,508	12,660	12,071
Arkansas	3,344	3,319	3,264
Louisiana	17,869	17,662	16,303
North	3,207	3,157	2,382
Gulf	14,662	14,505	13,921
Mississippi	3,396	3,439	3,046
New Mexico	8,634	9,397	7,237
Oklahoma and Kansas	37,612	37,579	36,965
Texas	132,264	134,600	129,827
East Texas	12,264	11,985	11,721
West Texas	57,295	59,171	59,716
Texas Gulf	28,099	28,568	25,926
Other Texas	34,606	34,876	32,464
Rocky Mountain	16,814	16,995	14,668
California	33,779	32,808	30,643
Foreign	11,807	11,684	7,437
Total	282,573	284,774	265,524

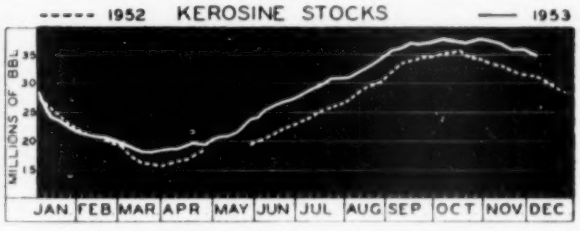
*Bureau of Mines.

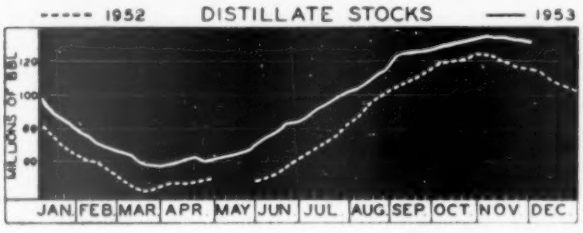


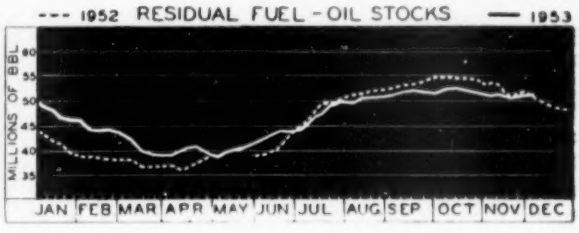










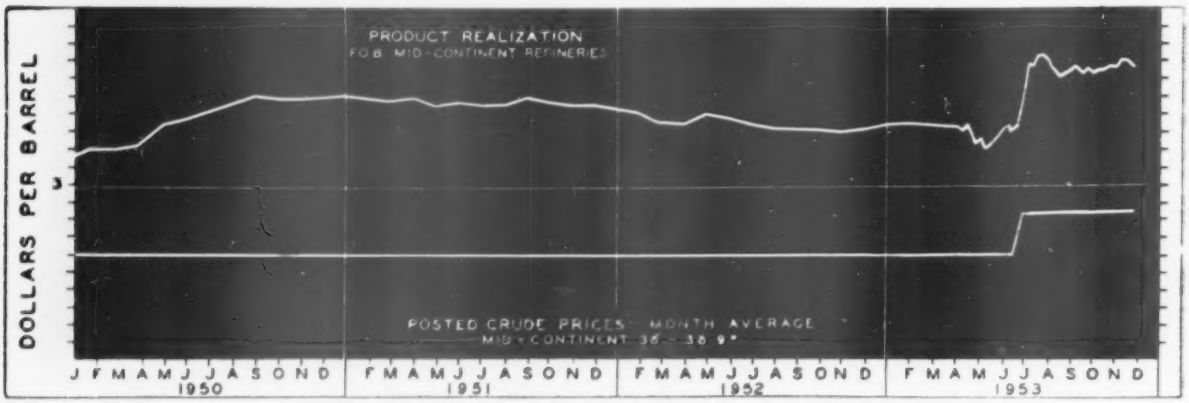


A.P.I. REFINERY REPORT, DECEMBER 5

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks† Gaso.‡	Kero.	Dist.	Resid.	Bureau of Mines, December 1952 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,024	439.7	31.0	239.0	236.8	33,050	14,519	48,964	11,929	1,058	441.8	45.2	283.8	247.8
Appalachian:														
District 1	112	52.8	6.8	22.2	12.2	4,046	632	1,677	911	108	48.3	5.9	18.8	14.5
District 2	92	53.5	6.2	14.4	14.0	2,097	649	761	142	94	47.9	7.6	15.0	15.1
Ind., Ill., Ky.	1,336	731.0	77.8	235.2	192.2	29,566	8,874	23,838	4,708	1,289	673.7	100.5	230.7	189.8
Okla., Kans., Mo.	599	353.0	18.2	145.5	55.2	15,453	1,941	12,134	1,375	566	333.2	14.3	139.3	63.9
Inland Texas	197	173.4	7.2	34.6	24.1	5,763	434	2,555	1,400	255	170.0	12.4	40.2	36.9
Texas Gulf Coast	1,682	836.4	142.6	368.3	240.0	22,399	4,142	15,705	6,894	1,717	802.0	139.2	427.3	262.5
La. Gulf Coast	565	299.1	70.1	115.3	60.6	8,769	2,372	6,975	1,678	553	267.9	71.0	123.8	56.4
N. La. and Ark.	82	36.3	7.9	16.6	6.3	3,648	546	945	176	85	34.9	9.8	19.5	7.1
Rocky Mountain:														
New Mexico	20	13.1		2.8	3.1	215		64	29	19	12.4	0.8	2.4	4.1
Other Rocky Mtn.	226	113.9	6.0	47.7	38.4	4,934	260	2,539	931	235	119.1	8.1	46.4	46.8
California	1,029	451.3	6.8	138.7	349.6	20,158	406	13,896	20,900	973	409.3	6.5	161.4	356.7
Dec. 5, 1953	6,964	3,553.5	380.6	1,380.3	1,232.2	150,098	34,775	130,053	51,073	6,952	3,360.5	421.3	1,508.6	1,301.6
Nov. 28, 1953	7,083	3,541.1	383.8	1,491.8	1,167.2	149,842	36,019	132,736	50,908					
Dec. 6, 1952	6,809	3,359.7	413.4	1,459.4	1,255.0	129,470	31,142	114,362	50,658					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
POSTED CRUDE PRICES - MONTH AVERAGE
MID-CONTINENT 36 - 38.9°
J F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952
F M A M J J A S O N D
1953

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.66 for week ended November 28, $3.71 for previous week, and $3.36 for November 1952. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot market quotations of leading suppliers as of December 8, 1953. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	11-11.5	12.5-13.5	11-11.75
Premium gasoline	12-12.5	14.0-14.5	12-12.75
42-44 w.w. kerosine	8.875-9.25	10.4	9-9.5
No. 2 straw fuel oil	7.875-8.25	9.4	8-8.5
No. 6 residual	$1.45-1.55	$2.25-2.40	$1.85-1.90

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.10	6.35

LUBRICATING OILS
South Texas

200 vis., No. 2-3 neutral	13.75
750 vis., No. 3-4 neutral	16.75
2,000 No. 5-6 neutral	18-18.75

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	20.5
200 vis., No. 3 neutral, 0-10 pp.	14.25

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	21.5
180 vis., 10 p.t. neutral	25.5

WAX
Mid-Continent

132-134 A.M.P.	6.0

THE spot market for petroleum products in the Mid-Continent last week was characterized by further strengthening for No. 6 and a continued high demand for gasoline.

Low postings for residual fuel were raised 5 cents a barrel, and much of the low-sulfur product on the spot market was moving at 10 cents over the new low of $1.45. Some suppliers reported a levelling off of inquiries, suggesting that a switch to coal was taking place in some areas as the No. 6 price increased, but others reported an even stronger demand than a week earlier. A few reported it difficult to find supplies to cover all orders.

In spite of the continued high demand for gasoline, there was no firming in this product, and there was some feeling that the price might decline further if sizable cuts in refinery runs don't materialize soon. One supplier said: "Gasoline demand is excellent; we're just making too darn much."

High stocks of gasoline tended to depress the natural-gasoline market. While posted prices remained unchanged from the previous week, movements were off. Some refiners were reported as having "no room to blend;" others were reported to be storing unblended gasoline with the apparent idea of holding it until the beginning of the next big gasoline-consuming season in mid-1954.

The distillate picture was considered "promising" but little changed from a week earlier. Suppliers still were waiting for needed frigid weather in the heavy-consumption areas to spark demand for burning oils.

On the East Coast a further weakening in gasoline was noted, with postings dropping as much as half a cent a gallon on both premium and regular. Supplies for some time had been considered more than ample, with reports of discounting prevalent.

On the Gulf, the spot-market picture was little changed, with all products in adequate supply and easily available.

CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.50		$2.37
21-21.9	2.30	2.52		2.39
22-22.9	2.37	2.54		2.41
23-23.9	2.45	2.56		2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast ‡Includes New Mexico Permian.

Prices East of California effective June 15, 1953. California prices effective February 16, 1953. Pennsylvania Grade prices effective September 21, 1953.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.05
Southwest Pennsylvania	3.61
West Virginia	3.55
Ohio	3.54
Illinois Basin	3.02

CLASSIFIED ADVERTISING

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

UNDISPLAYED CLASSIFIED 20c a word one issue. 10% Discount three or more consecutive issues. $4.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$14.00 a column inch one issue . . .
10% Discount three or more issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

EQUIPMENT FOR SALE

FOR SALE: Electric Generator Units: One Caterpillar Diesel D8800 with 50 KW Generator, at Garnett, Kansas—$6,000.00. One 350 HP. L3000 LeRoi Engine with 175 KW Columbia Generator at Hays, Kansas—$10,000.00. For further information, contact Joe A. Huitt, Deep Rock Oil Corp., Box 1051, Tulsa, Okla.

BROWN 100″ and 25″, 1000# wp Square Root, 1-10 liquid or gas flow meters, used, less mercury, $175.00 ea. W. J. Stroud, Bel Oil Corporation, Elton, Louisiana.

SPUDDER RIG Bargain. $750.00 no tools. Need money my part drilling shallow proven lease. Or sell part of lease. Box 235, Wagoner, Oklahoma.

10″ LINE PIPE
Immediate Delivery

19,000′—10¾″ OD 40.48# Youngstown Grade B Electric Weld, cleaned, straight 40′ DRL, ends beveled. Used excellent condition. Priced low for prompt shipment Labadie, Mo.

MID-STATES PIPE & SUPPLY CO.
Ph. 2-9128 Tulsa, Okla.

FOR SALE
COMPLETE COMPRESSOR STATION

Two 600 H.P. Type L.V.G. Ingersoll Rand gas engines with high pressure compressors. Engines and compressors complete including Parkersburg Building. Located twenty miles from Houston. Contact—

PETROLEUM MANAGEMENT CO.
565 San Jacinto Building, Houston, Texas
Phone: CHarter 4781

NEW STEEL PIPE

7″	O.D.	.317 wall	200 feet
8⅝″	O.D.	.352 wall	1000 feet
9⅝″	O.D.	.395 wall	1680 feet
9⅝″	O.D.	.460 wall	1000 feet
10¾″	O.D.	.250 wall	380 feet
12¾″	O.D.	.250 wall	400 feet
16″	O.D.	.250 wall	460 feet
20″	O.D.	.281 wall	300 feet
24″	O.D.	.281 wall	720 feet
24″	O.D.	.406 wall	920 feet
26″	O.D.	.281 wall	1600 feet
26″	O.D.	.312 wall	820 feet
26″	O.D.	.500 wall	120 feet
30″	O.D.	.500 wall	1000 feet

All 40 foot lengths
Electric Weld Rejects
Special Low Price
for Immediate Delivery

Write—Wire—Phone

SONKEN-GALAMBA CORPORATION
2nd and Riverview (X-100)
Kansas City 18, Kansas
ATwater 9305

EQUIPMENT FOR SALE

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

REDA PUMP complete w/☰4—20 Motor, 45½ H.P., 650 Volt, 41.6 Amps. ☰90—Pump Housing, ☰5595—Switchboard w/recording Ammeter 3400′—☰4 Cable 125 Amp. Auto Transformer Accessories. Engine 225 H.P. Climax Type R-225 on Skid. Alternator G. E. 125—KVA, 100 KW, 440 V. A. C. w/Transformer, Flexible coupling and skid base. House—10′ x 18′ wood frame, w/G.I. Roof and Siding on Skid. Engine—165 Hp. Climax R-61 on Skid. Herndon Drilling Co., 421 Mayo Bldg., Tulsa. Phone 4-9700.

FOR SALE: Bucyrus-Erie Model 24-L Spudder, Trailer Mounted, Tool Crane, Casing Tackle Strut, Guy Lines, Turnbuckles, Casing Line and Casing Blocks and Hook. Buckeye Supply Company, 18 Harrison Street, Zanesville, Ohio. Phone 2-3641.

USED EXCELLENT CONDITION IN OPERATION

One Each (4¾″ to 1″) (13⅜″ to 4½″) LANDIS Leadscrew Receding Head Pipe Threading and Cutting Machine Motor Driven.

OILFIELD SALVAGE CO., INC.
Phone CHarter 6514
P. O. Box 2589 Houston

USED LINE PIPE

15 miles 10¾″ OD Electric Weld 28.04# PE BFW. Approx. length 37′. 51 miles 9⅝″ OD Seamless 23.57# PE BFW. Approx length 35′. 6 miles 6⅝″ OD Seamless 17.02# PE BFW. Approx. length 35′. We consider the above first-class merchandise.

BETHLEHEM SUPPLY CO.
BOX 2171, TULSA, OKLAHOMA
PHONE 5-9261, EXT. 361

EQUIPMENT FOR SALE

MODEL H CARDWELL servicing unit with mast. Truck mounted. Fully equipped. Now operating in Central Kansas. Box G-823, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Failing Model 1500 drilling equipment. Have available for sale several drills exceptionally complete and in excellent condition. Particularly suitable for water well or deep core work. This equipment relatively new and now operating. Substantial savings possible. Box G-738, The Oil and Gas Journal, Tulsa, Oklahoma.

Easy Joint Break-out!
ARMITE DRILL COLLAR & TOOL JOINT COMPOUND
ARMITE LABS., 6080 Broad St., Los Angeles 1, Calif.
Ball & Black Supply Co., 2871 E. Pico, L. A. 23, Calif.

NEW PIPE
NORTH TEXAS AREA

5½″	O.D. 15.5# J-55 LT&C R-3 1410′	foot	$1.95
7″	O.D. 20# J-55 RT&C R-3 4431′	foot	2.12
7″	O.D. 23# J-55 RT&C R-3 3950′	foot	2.40
8⅝″	O.D. 36# J-55 RT&C R-3 2002′	foot	3.60
2″	—3.75# LW API Line Pipe—T&C 7011		.37
2½″	—5.90# LW API Line Pipe—T&C 4002		.55
3″	—7.70# LW API Line Pipe—T&C 2509		.70
4″	—11.00# LW API Line Pipe—T&C 1099		.99

All the above material is new and API. Supplied by J&L Steel Company. San Juan Oil Company is closing this stock located near Graham, Texas. All material subject to prior sale.

Contact H. E. Wright, 903 Employers Insurance Building, Dallas, Texas, Sterling 5331 or Mr. Robert Johnson, Phone 1337 J, Graham, Texas.

FOR SALE

Complete Rotary Drilling Rig—Emsco 350 Draw Works with three Wakdu Waukesha drive——New Oil Well 7¼ x 14 Pump——120 ft. Lee C. Moore mast. Now operating near Chinook, Montana. Rock Bottom Price.

Chas. Beu

NORTHERN PUMP CO.
Chinook, Montana

EQUIPMENT FOR SALE

FOR SALE: (To settle estate) Complete Rotary Drilling Rig—U15 Unit Rig Draw Works with two ME66 Murphy Diesel Drive, 7¼ by 14 Emsco Pump, 96' Lee C. Moore Mast. Excellent Condition. Mrs. W. D. Kelley, Pampa, Texas.

FOR SALE: Heavy duty Star Spudder seamless pipe mast. Allis-Chalmers L 90 engine on skids. Drilling tools from 6" to 12½ in A-1 condition. Inventory and price on request. Mrs. Harry Leamon, McLouth, Kansas. Phone 117.

EVERYTHING in new and used equipment for well drilling. Fishing tools rented Save money, get quotations from Pressey & Son, Pueblo, Colorado.

ONE—5½ X 5½ X 12 Ingersoll-Rand Type XVG-1 Serial No. 4DV782 Direct coupled, 150 H.P. Gas Engine Driven Gas Compressor with (2) fixed Volumn clearance pockets, 1 MU-1 Maxim exhaust silencer, Air Maze Oil Bath type engine Air Filter and Manifold with valves adjacent to engine. 400# working pressure. Price $4,500.00. One 18" X 25'—9" Stabilizer tower heat exchange, etc. Used for removing 20# gasoline from Raw Propane and heavier mixture. Rated capacity 700 gals. per hour. Price $2,500.00. One—Natural gas scrubber 24" dia. X 10' with 6" flanged openings, 500# working pressure. Price $350.00. All prices F.O.B. Campbell, Wyant & Cannon Foundry Co., Muskegon, Michigan.

FOR SALE: One 42 Cyclone—2 years old, mounted on International truck, both in very good condition. Machine 3 years old, has Bucyrus-Erie Beam and Rubber Shock Absorbers in mast. Glenn Hottal, R. #2, West Salem, Ohio. Phone Congress 5442.

GAS METERS, Westcott, Foxboro and Emco. Good condition and can furnish most any type or capacity. Geo. R. Milner, Okmulgee, Oklahoma.

250,000 FT. 8⅝ o.d. pipe with collar and plain end. $1.00 per foot Oklahoma. Rogers & Lindquist, 620 Wright Building, Tulsa, Okla. Phone 3-2072—5-8850.

FOR SALE: Complete refrigeration type propane recovery plant for sale near Snyder, Texas. Capacity—25,000 MCF per day gas at 450# gauge; 30,000 gallons per day propane. Gas Products Development Corporation, 201 Oil Capital Building, Tulsa Oklahoma.

FOR SALE—B & K Pipe Machine with Landis Head, Range 4½" OD to 13" OD w/ 7½ HP Westinghouse Motor, mounted with Vee Belt drive with several sets chasers 8 V and 8 Rd. Good condition. Ready to operate. Priced to sell. Fort Worth Pipe and Supply Co., Fort Worth, Texas.

FOR SALE: 3997', 5½", 15#, J-55, Range 3, Spang Seamless Casing. 2500'-3000' rotary rig complete with 2600', 3½" drill pipe. Now drilling. Shira Drlg. Co., Box 467, Eureka, Ks. Ph. 1141.

2 HYDRAULIC pipe pulling units mounted on half track, one on tandem trailer A. C. Duncan, 532 North Cheyenne, Tulsa Oklahoma.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-38 Engines, skid mounted immediate delivery. Also Byron Jackson, Carter Centrifugal Units Westinghouse 20-25-50 KW Generating Units

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

EQUIPMENT WANTED

NOTICE: We buy. We sell equipment everywhere. If you want to sell or buy contact Pressey & Son, Pueblo, Colorado.

WILL BUY complete string cable tools 10" down from individual. Write description, price, Box G-822, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale. Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer. See box heading for classified rates or write The Oil and Gas Journal.

HELP WANTED

MANUFACTURERS' representatives: To represent manufacturer of proved liquid level gauges to oil industry, foreign and domestic. Write full details: W. S. Olson, Suite 1111, 4753 North Broadway, Chicago, Illinois.

SEISMIC SUPERVISOR required by expanding and aggressive seismic contracting company. Should have ability to supervise any domestic area and have good professional contacts. Minimum requirements, college degree in geophysics or related fields and eight years' seismic experience. Good future. Tulsa location. Box G-705, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Experienced architectural draftsman capable of inspecting and supervising construction. Furnish sample, give age, educational background, and references. Address Personnel Department, Cities Service Oil Company, Bartlesville, Oklahoma.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co Box 2803, Tulsa, Okla. $5.00 cash.

OIL INDUSTRY Employment Service, 405 Tuloma Bldg., Tulsa, Okla. Suggest you file resume of your education and experience with us.

SALES ENGINEER — geology background preferable, but not necessary. Locations in Dallas and Fort Worth area and in Houston. Reputable well logging company. Guaranteed $300 per month drawing account plus commission and traveling expenses. Should make $1500 per month easily. Box G-818, The Oil and Gas Journal, Tulsa, Oklahoma.

WELDING SPECIALIST
PETROLEUM REFINERY CONSTRUCTION—BRAZIL

Qualified applicant must have:
a) theoretical and practical knowledge of welding, including experience with welding of alloy steel.
b) thorough technical and practical knowledge pertaining to the welding of API & ASME code vessels and pressure piping codes.
c) experience in training and qualifying code welders.

Challenging position, excellent salary + subsistence allowance. Selected applicant's immediate family transported and returned by air at our expense.
Interviews arranged in New York City at our expense on basis of confidential resume. Airmail complete detailed chronological resume, including salary history to

PERSONNEL DEPARTMENT
HYDROCARBON RESEARCH, INC.
115 Broadway — New York 6, N. Y.

SALES ENGINEER
Up to $10,000

Graduate Engineer Preferred

Experienced in Plant Instrumentation or related fields.
Interviewing and moving expenses, plus our fee, all paid by Company.

Send complete and up-to-date resume to—

CHAS. J. LOVELESS PERSONNEL SERVICE
Suite 616 South Main—Tulsa, Oklahoma

HELP WANTED

OPERATORS PETROLEUM REFINERY

Minimum five years experience in petroleum refinery operations to supervise initial operations and instruct personnel in operatin of petroleum refinery units now being constructed in U.S. and abroad. Responsibility will be similar to refinery Shift Foreman.

Challenging opportunity. Excellent base salary, plus bonus and subsistence allowance.

Interviews arranged in New York City at our expense on basis of confidential, complete chronological resume, including education & employment (names and addresses of employers, dates employed, positions held, salaries received, location & type of jobs).

AIRMAIL TO
PERSONNEL DEPARTMENT

HYDROCARBON RESEARCH, INC.
115 Broadway — New York 6, N. Y.

EXPERIENCED GRADUATE ENGINEER with electrical and instrumentation background for engineering department of Southwest Refinery. Box G-785, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS AND CHEMISTS (4)—With petroleum refinery experience and familiarity with fluid catalytic cracking process. Opportunity in catalyst sales engineering, technical service, or catalyst laboratory testing. Write to The Davison Chemical Corporation, Baltimore 3, Maryland, stating age, qualifications, and salary requirements. All replies considered as confidential.

SOUTH AMERICA. Major Oil Company. Our fee paid. Mechanical Engineer—Petroleum Engineer—Chemical Engineer—Geologist—All requiring Degree, experienced or inexperienced. Mud Technician — two or more years' experience, single. Tool Pusher—under 40, three years' experience. Accountant—Degree, Accounting major, single. All information confidential. Contact CHAS. J. LOVELESS PERSONNEL SERVICE, 616 S. Main, Tulsa, Oklahoma. Phone 3-5168.

CHIEF CHEMIST experienced in Pod column work and gasoline plant process and product control testing to take charge of laboratory located at large gasoline plant in West Texas. Housing furnished and salary to be commensurate with qualifications of applicant. Please furnish experience record and salary expected. Our employees have been notified of this advertisement. Box G-776, The Oil and Gas Journal, Tulsa, Oklahoma.

THE POSITION YOU WANT: Oil industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal.

SITUATIONS WANTED

PETROLEUM GEOLOGIST, desires position with independent or major oil company. B.S. degree, 2½ years well sitting experience West Texas—New Mexico and Williston Basin. Subsurface mapping, field and regional stratigraphic studies, electrical log interpretation and correlation experience. Interested in stratigraphy and sedimentation research. Write Box G-821, The Oil and Gas Journal, Tulsa, Oklahoma.

WOMAN GEOLOGIST, age 29, seven years petroleum experience in subsurface (micropaleontology, stratigraphy, and structure) desires challenging position. Box G-806, The Oil and Gas Journal, Tulsa, Oklahoma.

MANUFACTURER'S AGENT with excellent sales record, college education, engineering and mechanical background, can represent one more manufacturer in the state of Oklahoma. Box G-805, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

EXECUTIVE—CERTIFIED PUBLIC ACCOUNTANT—COLLEGE DEGREE offers 17 years' experience in developing and managing oil and gas properties, operating hydrogen recovery plants. Familiar with taxes, financing, marketing, lease arrangements, joint ventures. Seeking responsible position in Houston. George D. Blocher, 5038 Wichersham Lane, Houston 19, Texas.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628, Ph. No. 3-3141, Hobbs, New Mexico.

AVAILABLE, Construction Superintendent. Roads, bridges, harbor work, plant erection, prefer foreign contract. Write Walkinshaw, Room 506, 372 Bay Street, Toronto.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column. Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

ELECTRICAL CONTRACTORS

Office Phone	Res. Phone
8-6315	7-4956

W. L. RATCLIFF COMPANY
ELECTRICAL CONTRACTORS
Industrial—Commercial—Distribution

W. L. Ratcliff	506 Caddo St.
P. O. Box 373	Shreveport, La.

PRODUCTION PROPERTY WANTED

WANTED
TO BUY
OIL PAYMENTS, ROYALTIES
AND PRODUCING PROPERTIES

Several of the Southwest's outstanding philanthropic institutions want to purchase oil payments, royalties, or producing properties of any size on a favorable basis to the seller. If your year-end, general tax, or financial plans indicate such a sale, send complete data and information to

Box G-807, The Oil and Gas Journal,
Tulsa, Oklahoma

FINANCING

GAS FINANCING

We finance the installation of gathering systems, compressor stations, processing plants, etc., and purchase casinghead and natural gas.

Well owners are paid for their gas and also participate in operations. Reply in confidence to

Box G-802

The Oil and Gas Journal

Tulsa, Oklahoma

ROYALTIES

700 MINERAL ACRES under major company leases on surface structures in Dunn and Mercer Counties, North Dakota, where active drilling programs now under way. Box 394, Watertown, New York.

WILL SELL nonproducing royalty, 660' from Devonian test now being drilled in Lea County, N. M. Contact Mrs. Fannye Holloway, 819 North Thorpe, Hobbs, N. M. Telephone 3-2748.

FREE TAX INFORMATION for those desiring to sell their producing royalties, overrides or production. Robert L. Kinkaid, Box 26, Tulsa, Oklahoma.

GET TOGETHER: Both Capital and Royalties are available. If the investment proposition you want isn't listed in this column, use a Journal classified advertisement to find it. See box heading for classified rates or write The Oil and Gas Journal.

WANTED
TO BUY
OIL PAYMENTS, ROYALTIES
AND PRODUCING PROPERTIES

Several of the Southwest's outstanding philanthropic institutions want to purchase oil payments, royalties, or producing properties of any size on a favorable basis to the seller. If your year-end, general tax, or financial plans indicate such a sale, send complete data and information to

Box G-807, The Oil and Gas Journal,
Tulsa, Oklahoma

Wanted
GAS and OIL PRODUCTION

Principals seek to acquire
or buy into

SETTLED and ECONOMICALLY SOUND GAS and/or OIL PRODUCTION

Send information, including reserves, life expectancy of field and asking price to—

Box G-810

The Oil and Gas Journal

Tulsa, Oklahoma

OIL PRODUCTION

WILL GO IN ON any kind of oil deal, settled production to wildcat provided it is right. Give complete details in first letter. P. O. Box 6301, St. Petersburg Beach, Florida.

REAL ESTATE

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

ODESSA WAREHOUSE SPACE AVAILABLE
Located in center of town just off Highway 80. Up to 1600 sq. ft. available. Joint tenancy. Can be arranged with telephone answering and warehouseman service.
STENTZ EQUIPMENT COMPANY
P.O. Box 3367 Phone: 8-3388
Tulsa, Oklahoma

REAL ESTATE

FOLLOW THE BOOM in uranium used for atom bombs. I offer 30 claims near Uravan, Colorado, for $2,000 each for immediate sale. Dyer, 1835 Champa, Denver, Colorado.

LEASE AND DRILLING BLOCKS

FIVE THOUSAND ACRES in Roane County, rental been paid for 35 to 40 years on these leases. Will turn them over free to any one who will drill them for ⅛ overriding royalty. M. (Eddie) Hersman, Spencer, West Virginia.

160 ACRES wheat land, Twp. 163, Range 95, Divide County, North Dakota. $15,000, or ½ mineral rights $8,000. 4118 Cedar Avenue, Minneapolis, Minnesota.

$30,000 DEFAULTED BONDS, Town of Slick, Oklahoma; 75% discount. Oil town. Box G-819, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL SELL or make deal for well on a Ten Year Lease—block of Seven Thousand Acres, Central Arkansas, on good structure. Box G-820, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

SEE A. L. Bowles, Rollow Building, Ada, Oklahoma, for drilling deals.

WILL CONSIDER DEVELOPMENT and exploration of large acreage lease. Must be of considerable acreage, or not interested. Box 22, Emmaus, Pa.

2,000 ACRE 5 year leaseblock, Noble County, Oklahoma. Ready to drill this year. Excellent geology. Robert L. Kinkaid, Box 26, Tulsa, Oklahoma.

FOR SALE: 160 acres minerals, Williston Basin, Dunn County, North Dakota. Description: S/2 section 17 and N/2 section 20, Township 142 North, Range 95 West. Being 640 land acres. Under oil and gas lease to Magnolia Petroleum Company. Write for price. Geo-Tran Exploration Company, 2528 Rogers, Fort Worth, Texas.

FOR SALE: Three leases, Dutcher sand near Tulsa. Eleven Well, Nine Barrel daily. $20,000.00. No Brokers. Box G-817, The Oil and Gas Journal, Tulsa, Oklahoma.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

FOR SALE

320 acres of producing oil leases located in Daviess County, Indiana. These leases comprise an entire pool and are to be sold to settle an estate. Contact

JOHN W. CANNON
601 Tenth Street, Lawrenceville, Illinois

LEASES ROYALTIES
Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited
B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

LEGAL

The Nevada Oil and Gas Conservation Commission will conduct a public hearing relative to the adoption of state-wide rules and regulations of the Commission on Tuesday, December 29, 1953, at 10:00 a.m., in the Executive Chamber, State Capitol, Carson City, Nevada. Persons wishing advance copies of the proposed rules and regulations may obtain them by writing the Commission at Box C, University Station, Reno, Nevada. Joseph Lintz, Jr., Secretary.

Equipment Men

. . . in the News

Webber Visits South America for Martin-Decker

LOUIS WEBBER

Louis Webber, general manager of Decker-Martin Corp., has just completed a 7-week survey, sales, and service trip to Trinidad, Columbia, and Peru. He introduced new product developments to these countries and appointed Donald E. Merritt, Precision Technologicia C. A., of Maracaibo, Venezuelan distributor for Martin-Decker equipment.

Van D. Clothier Moves North California Branch

Van D. Clothier, Inc., West Coast representative of Wolverine Tube Division, Calumet & Hecla, Inc., Detroit, has moved its northern California branch to new and larger quarters on South B Street, San Mateo.

The announcement was made by Clothier, president, from the company's headquarters in Los Angeles.

John A. Marshall will continue as manager of the northern California operation.

Imperial Oil Awards Two Contracts at Sarnia Plant

Two major contract awards, part of a general expansion and modernization of Imperial Oil's Sarnia refinery, have been announced by R. W. Dunlop, manager of the engineering division of Imperial's manufacturing department.

Canadian Bechtel, Ltd., has been awarded contracts for a warehouse and packaging plant and a mechanical shop to centralize maintenance work at the refinery. Both projects are part of a 6-million-dollar construction program, which includes a laboratory for supervision product quality. The laboratory contract was let last month. These three projects are in addition to the new process units, on which 14 million dollars have been spent in the last 2 years.

The packaging plant will be the most modern in Canada and will cover a floor area of 90,000 sq. ft. It will be highly mechanized to handle Sarnia refinery's shipments of lubricants and other products in drums or smaller packages. The building will house eight packaging machines, two of them fully automatic.

Canadian Bechtel expects to complete the packaging plant by August. The site is at the northwest corner of the refinery, and during preparation of the ground, workmen uncovered several old underground tanks. They were built before the turn of the century when Imperial began refining operations at Sarnia. Made from curved wooden planks, they were coated on the outside with an oil-tight wrapper of blue clay.

Dravo Corp. Appoints Leilich Project Engineer

Dravo Corp., Pittsburgh, has announced the appointment of Henry A. Leilich as project engineer for the machinery division. His efforts will be directed primarily in the fields of power-plant engineering and construction.

Formerly a staff engineer with P. F. Loftus Corp., Leilich has had more than 20 years' experience in property-valuation surveys, construction supervision, and design and specification writing for industrial construction projects. He is a graduate of Washington University, St. Louis, and a registered professional engineer.

French Firm to Manufacture Reflin Plastic Pipe

Societe Des Fonderies de Pont-a-Mousson, Nancy, France, will produce glass-fiber reinforced plastic pipe under license from Reflin Co., Los Angeles. In a joint announcement, Louis L. Potomac, Reflin president, and Hubert Cousin, president of Pontex Corp., New York City, an affiliate of the French firm, stated that the agreement calls for Reflin to supply engineering and technical information to enable Pont-a-Mousson to manufacture Reflin pipe in France, Belgium, Cuba, Germany, the Saar, and Spain.

Potomac first gained industrial attention, prior to his association with Reflin, by founding Alsynite Co. of America, manufacturer of glass-fiber panels.

Ohio Brass Adds Southwest Valve Representatives

Ohio Brass Co., Mansfield, Ohio, has announced appointment of C. F. Adams Co., Fort Worth, as its valve sales representative in Texas, Arkansas, Louisiana, and Mississippi; and C. B. Parkhurst & Co., Tulsa, as valve sales representative for Oklahoma and Kansas.

The assignments, effective December 1, were made by I. R. Roberts, Ohio Brass manager of valve sales. The territory assigned to C. F. Adams includes all of Texas, except the Panhandle area.

WILDCAT COMPLETIONS

(Continued from page 213)

Los Angeles County: R. E. Bering & Associates 1 Perkins, 11-3n-16w. Dry. TD 4,200 ft.

Porter Sesnon et al 65-10 Quinby, 10-2n-16w. Dry. TD 6,910 ft.

Union Oil Co. 23 Simi, 9-3n-17w. Dry. TD 9,492 ft.

San Benito County: Idria Petroleum Corp. 1 Barnett-U. S. L., 33-16s-12e. Dry. TD 2,417 ft.

San Luis Obispo County: General Petroleum Corp. 1 Mahoney, 9-10n-35w, IPP 46 BOPD, 13.4° gravity, perfs. 3,800-3,922 ft., TD 4,501 ft. (New field discovery 3 miles southeast of Guadalupe field.)

Santa Barbara County: Union Oil Co. 18 Dome, 24-9n-34w. Dry. TD 11,639 ft.

Tulare County: C. H. Olsson 1 Menne-Flynn, 10-24s-28e. Dry. Bottomed in granite. TD 312 ft.

MONTANA

Carbon County, Parker area: J. E. Sadring 1 Sadring, C NW NW 2-7s-24e. Suspended. 400 TD.

Cascade County, Griffen: Petroleum Producers and Refiners Corp. 1 Griffen Coal Mines, SW SW SW 12-18n-4e. Shut down. TD 850 ft.

Rosebud County, East Procupine: Quintana Production Co. 1 N. P. R. R., C SW NE 29-10n-41e. Dry. TD 8,467 ft. Winnipeg 8,450 ft. (?).

Indian Creek: Seaboard Oil Co. 1 Indian Creek, C SW SE 1-12n-35e. Dry. TD 4,306 ft. Otter 4,210 ft.

Valley County, Glasgow area: Harrison & Abercrombie 1-X Government, C NW NW 19-25n-35e. Dry. TD 7,219 ft. Ashern 6,630 ft.

WYOMING

Big Horn County, Southeast Manderson: Dee Davenport 1 Ziegler Expl. Co. Government, C SE NW 19-49n-91w. Dry. TD 7,124 ft. Tensleep 7,072 ft.

Walter's dome: Chinook Petroleum Co. 1 Government, C Lot 4 (SESW) 14-50n-90w. Dry. TD 2,070 ft. Madison 1,965 ft.

Crook County: Woods Drilling Co. 1 Government, NE NW NW 26-49n-67w. Dry. TD 3,220 ft. Second Wall Creek 1,960 ft.

Jay Huisman 1 Shelldorf, NE NW SW 12-50n-63w. Dry. TD 2,297 ft. Deadwood 2,098 ft.

Fremont County, Cosden Anticline: Cosden Petroleum Corp. 1 Government, SE SE NW 27-31n-99w. Dry. TD 1,150 ft. Madison 1,031 ft.

Johnson County, South Billy Creek: British American Oil Prod. Co. 1 C. A. Case, C SE SW 4-47n-82w. Dry. TD 3,790 ft. Second Front sand 3,392 ft.

Natrona County, Emigrant Gap: Laslett & Swisher 1 Government, NE NE SW 33-35n-82w. Dry. TD 1,565 ft. Sundance 1,150 ft.

Sublette County, Dry Creek: Arthur B. Belfer D-2 Government, NE SW 16-28n-113w. Dry. TD 4,633 ft. Hilliard 3,720 ft.

Uinta County, Spring Valley: Hathaway 3 Tobin, NW NW NW 26-15n-118w. Dry. TD 2,201 ft. Tertiary base 520 ft.

Weston County, Cheyenne River area: North Drilling & Prod. Co. 1 Government, NW NW NW 12-41n-67w. IPF 152, BOPD,

Newcastle discovery (new field). Newcastle 7,812 ft. TD 7,930 ft.

Weston County: Mars Drilling 1 Horton, NE SE NE 7-44n-61w. Dry. TD 2,804 ft.

Mars Drilling 1 State, NE SE NE 36-45n-62w. Dry. TD 1,499 ft. Newcastle 1,424-32 ft.

COLORADO

Adams County: Eddie Fisher 1 Gottwald, NE NE NW 30-1s-58w. Dry. TD 6,437 ft. "J" sand 6,155 ft.

Bay Petroleum 1 U. P. R. R. SE SW SW 25-3s-58w. Dry. TD 5,630 ft. "J" sand 5,470 ft.

Larimer County, Spottlewood: Amerada Petroleum Corp. 1 Colorado State, NW NE SE 16-11n-68w. Dry. TD 9,533 ft. Lyons 9,200 ft.

Logan County: Lowell & Daniels 1 Walek, SE SE SE 15-7n-54w. Dry. TD 5,190 ft. Skull Creek 5,182 ft.

Shell Oil Co. 1 Hosford, C NW SE 2-7n-55w. Dry. TD 5,560 ft. "J" sand 5,421 ft.

The Kimbark Co., Ltd., 1 Karg, C SW NW 35-11n-49w. Dry. TD 4,051, Base "J" sand 3,980 ft.

Morgan County, North Adena: Bill Tomberlin 1 Cochran, SE SE NW 12-1n-58w. IP Tested 60 BOPH, 3-hour test, "J" sand discovery (new field.) "J" sand 5,658 ft. TD 5,734 ft.

Ryan Oil & Davis Oil 1 Doll Delaney, C SE SE 35-1n-58w. Dry. TD 6,101 ft. "J" sand 5,913 ft.

Sedgwick County: S. D. Johnson 1 Brinkeman, SW SW SE 11-9n-43w. Dry. TD 3,381 ft. "J" sand 3,257 ft.

Washington County: Deep Rock Oil Corp. 1 W. F. Ernst, C NW SE 6-5s-49w. Dry. TD 6,878 ft. Reagan 6,802 ft.

Shell Oil Co. 1 Segelke, SE SE NW 6-5n-54w. Dry. TD 5,090 ft. "J" sand 4,961 ft.

Weld County: Spears & Colorado-Wyoming 2 Henry Zimbleman, Jr., SW NE NE 22-2n-63w. Dry. TD 7,133 ft. "J" sand 7,101 ft.

Wildhorse Creek: Max Krueger 1 Adam Hilzer, C NE NE 13-10n-60w. Dry. TD 7,513 ft. "J" sand 7,446 ft.

Yuma County: Canada Southern Oil, Inc. 1 Doyle Neiman, NE NW SW 10-5n-64w. Dry. TD 6,342 ft. Granite Wash 6,319 ft.

SASKATCHEWAN

Socony-Sohio 1 Axe Lake, LSD 9, 29-29-23w2. Dry. TD 3,543 ft.

Imperial-Tide Water 5-20 Chambery, LSD 5, 20-5-18w3. Dry. TD 5,320 ft.

Potash Co. of America 6 Saskatoon, LSD 1, 34-35-3w3. Dry. TD 3,665 ft.

Shell 12 Wood Mountain, LSD 16, 35-3-6w3. Dry. TD 5,750 ft.

ALBERTA

Hudson's Bay-Gulf-Superior 1 Evarts, LSD 3, 15-38-3w5. Blairmore sand gas well. PBTD 7,217 ft. TD 9,600 ft.

Trican 1 Glendon, LSD 11, 21-61-8w4. Dry. TD 1,210 ft.

Amerada 2-11 Crown YF, LSD 12, 11-69-22w5. D3 oil well. TD 8,545 ft.

Amurex-Anglo Canadian 17-9 Sunnynook, LSD 9, 2-26-12w4. Dry. TD 3,501 ft.

Socony 14-11 Wimborne, LSD 11, 14-34-26w4. D2 oil well. PBTD 7,360 ft. TD 7,750 ft.

LEGAL

Notice is hereby given that sealed bids for oil and gas leases on approximately 20,803.76 acres of Tribal and Allotted restricted Indian lands in Roosevelt and Valley Counties on the Fort Peck Indian Reservation, State of Montana, will be opened at 2:00 o'clock P.M., Mountain Standard Time, January 12, 1954, at the Fort Peck Indian Agency, Poplar, Montana. Those individuals desiring specific information in connection with this sale may contact the Superintendent, Fort Peck Indian Agency, Poplar, Montana, or telephone Poplar 2181.

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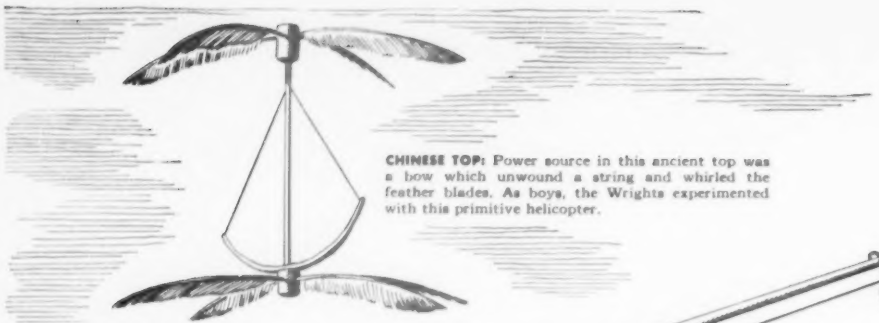
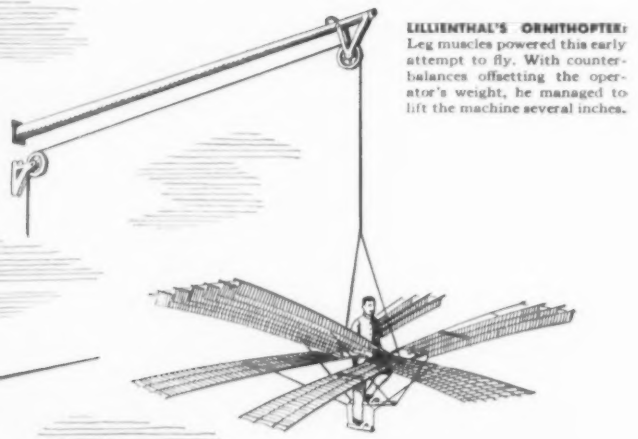
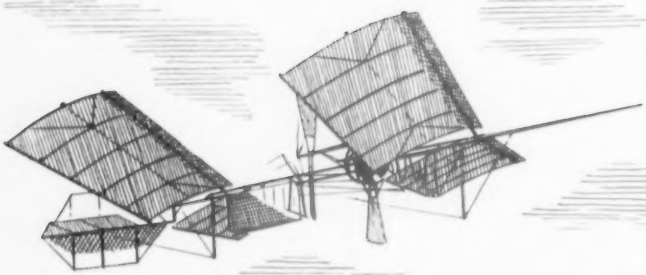


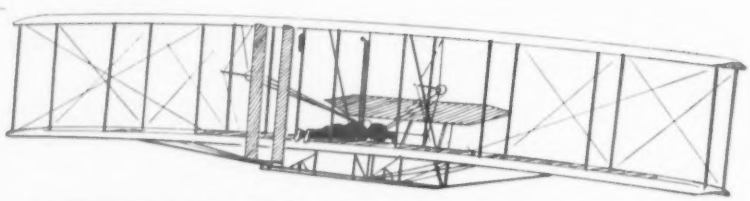
CHINESE TOP: Power source in this ancient top was a bow which unwound a string and whirled the feather blades. As boys, the Wrights experimented with this primitive helicopter.



LILLIENTHAL'S ORNITHOPTER: Leg muscles powered this early attempt to fly. With counterbalances offsetting the operator's weight, he managed to lift the machine several inches.



LANGLEY'S AERODROME: A steam engine powered this model which flew 3200 feet in 1896. Efforts to fly it as a full-sized, man-carrying plane met with failure.



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AMONG popular misconceptions is the idea that the Wrights built a sort of box kite, added an engine—and flew. Actually, their success followed one of the most patient and original *research programs* ever undertaken.

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* * *

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1927—Evaluations of fuel performance, with the first variable-compression-ratio engine, mark the beginning of Shell's Wood River engine laboratory, later to become one of the nation's largest engine-testing centers.

1934—Shell delivers 100-octane gasoline to Army Air Corps in first commercial quantities at 71¢ a gallon. Its previous cost had been $25.

1942—Cumene, fuel additive developed by Shell and made available to entire industry, results in 20% increase in production of 100-octane gasoline during first 2 years of World War II.

1949—Shell develops the additive, TCP, to increase the efficiency of military aircraft engines by counteracting the effect of metallic deposits.

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Above: Davidson Drilling Company rig drilling Stanolind Guadalupe No. 1 in the hills west of Carlsbad, N. Mex.

Left: (L to R) G. E. Clements, tool pusher, and C. I. Woodroof, drilling supt., of Davidson Drilling Co., Odessa, Tex., and T. R. "Cotton" Foster, TRU-LAY field man.

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Christmas tour

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